ADICCIONES

ISSN / 0214-4840
E-ISSN / 2604-6334

PUBLISHED BY:
SOCIDROGALCOHOL
Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y las otras Toxicomanías

FUNDED BY:
MINISTERIO DE SANIDAD
SECRETARÍA DE ESTADO DE SANIDAD
DELEGACIÓN DEL GOBIERNO PARA EL PLAN NACIONAL SOBRE DROGAS

ADICCIONES

PUBLISHED BY:
SOCIDROGALCOHOL
Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y las otras Toxicomanías

FUNDED BY:
MINISTERIO DE SANIDAD
SECRETARÍA DE ESTADO DE SANIDAD
DELEGACIÓN DEL GOBIERNO PARA EL PLAN NACIONAL SOBRE DROGAS

SEND CORRESPONDENCE TO: SOCIDROGALCOHOL ■ Avda. de Vallcarca, 180 ■ 08023 Barcelona
(+34) 932103854 ■ revistaadicciones@socidrogalcohol.org ■ www.socidrogalcohol.org

ISSN: 0214-4840 ■ **E-ISSN:** 2604-6334 ■ **SVPF:** 89010R ■ **LEGAL DEP.:** V-1543-1989

INDEXED IN: SOCIAL SCIENCES CITATION INDEX (SSCI-JCR), SCIENCE CITATION INDEX EXPANDED (SCIE-JCR), EMBASE, SCOPUS, MEDLINE, PSICODOC, PSYCINFO, IBECS, ÍNDICE CSIC, LATINDEX, REDALYC, INDEX COPERNICUS, PROQUEST, DIALNET, GOOGLE SCHOLAR, WEB OF SCIENCE (WOS).

2023 ■ VOL. 35 ■ N. 2
ADICCIONES

INDEX / ÍNDICE

EDITORIAL

ORIGINALS / ORIGINALES

REVIEW / REVISIÓN

PUBLICADO POR:
SOCIDROGALCOHOL
Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y las otras Toxicomanías

FINANCIADO POR:
MINISTERIO DE SANIDAD
SECRETARÍA DE ESTADO DE SANIDAD
DELEGACIÓN DEL GOBIERNO PARA EL PLAN NACIONAL SOBRE DROGAS

ADICCIONES

SOCIDROGALCOHOL
Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y las otras Toxicomanías

BOLETÍN DE SUSCRIPCIÓN

■ DATOS PERSONALES:

Nombre y apellidos .....

NIF..... Profesión .....

Dirección ..... Nº ..... Piso .....

Tel. ..... Población ..... C.P. ..... Provincia .....

E-mail .....

■ SUSCRÍBANME A: *ADICCIONES*. AÑO 2023

España	4 ejemplares y suplementos	50,00 €		suscripción particular
	4 ejemplares ,,	130,00 €		suscripción instituciones
	1 ejemplar	15,00 €		
	1 monográfico	20 €		
Extranjero	4 ejemplares y suplementos	90 €	90 $	suscripción particular
	4 ejemplares ,,	200 €	200 $	suscripción instituciones
	1 ejemplar	19 €	19 $	

Las suscripciones se entenderán por los cuatro ejemplares del año natural en que se realice la suscripción, sea cual sea el momento del año en que ésta se efectúe.

■ PAGARÉ:

A) **Por domiciliación bancaria (rellenar para ello la orden de pago que está a continuación y enviarnos el original por correo).**

B) Mediante cheque nº. ..... que adjunto a nombre de «Adicciones».

C) Transferencia bancaria a BANCO SABADELL ATLÁNTICO - Ag. Ganduxer, Vía Augusta, 246 - Barcelona
IBAN: ES81 0081 0653 7300 0116 0017
(Es importante que en la orden de transferencia conste claramente el ordenante de la transferencia para poderla identificar adecuadamente).

..... *de* ..... *de 20* .....

(Firma)

ORDEN DE PAGO POR DOMICILIACION BANCARIA

Nombre del titular de la cuenta .....

Nombre del Banco o Caja de Ahorros .....

Número Cuenta Corriente o Libreta **(ATENCIÓN: DEBE CONSTAR DE 20 DÍGITOS):**

Entidad ☐☐☐☐ *Oficina* ☐☐☐☐ *D.C.* ☐☐ *Nº* ☐☐☐☐☐☐☐☐☐☐

Dirección Banco o C.A.:

Calle o Pza. .....

Código Postal ..... *Población* ..... *Provincia* .....

Ruego a Vds. Se sirvan tomar nota de que, hasta nuevo aviso, deberán adedudar en mi cuenta los efectos que les sean presentados para su cobro por "Adicciones, Socidrogalcohol"

..... *de* ..... *de 20* .....

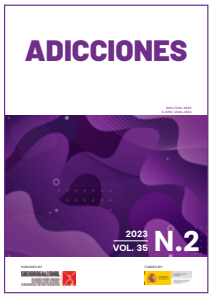
Atentamente (firma del titular)

ENVIAR ESTE BOLETÍN A: SOCIDROGALCOHOL ■ Avda. de Vallcarca, 180 ■ 08023 Barcelona
(+34) 932103854 ■ revistaadicciones@socidrogalcohol.org ■ www.socidrogalcohol.org

LA REVISTA ES GRATUITA PARA LOS SOCIOS DE SOCIDROGALCOHOL

SOCIDROGALCOHOL
Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y las otras Toxicomanías

ADICCIONES
2023 ■ VOL. 35 ■ N. 2 ■ PAGES 91–94
www.adicciones.es



EDITORIAL

On the issue of unconstitutionality raised by the Supreme Court regarding gambling advertising

Sobre la cuestión de inconstitucionalidad planteada por el Tribunal Supremo respecto de la publicidad del juego

Mariano Chóliz Montañés*.

* Unidad de investigación: "Juego y adicciones tecnológicas", Universidad de Valencia, España.

At the end of the last century, gambling ceased to be understood as a vice or a problem of willpower and came to be considered as a mental disorder, according to the two classifications of the most important mental illnesses in the field of science and health: DSM-III (APA, 1980) and ICD-9 (WHO, 1978). Pathological gambling was seen at this time as an impulse control disorder; that is to say, a mental pathology whose most characteristic symptoms are defined by the inability to stop gambling, even when the person in question cares about their money, health and the well-being of their own family.

In the 21st century, the current editions of both classifications, i.e., DSM-5 (APA, 2013) and ICD-11 (WHO, 2018), have recognised that what characterises this mental illness, beyond the difficulty in ceasing to bet, is the very need to play; that is, the gambler's dependence on gambling. The scientific proof of this addictive phenomenon is found in the fact that there is "…*evidence that gambling behaviour activates the reward system in a way similar to drugs of abuse and produces behavioural symptoms comparable to those caused by substance use disorders*" (APA, 2013, p. 481). Pathological gambling is thus currently considered a mental illness within the addictive disorders category, and it is recognised as such in both DSM-5 and ICD-11.

Considering pathological gambling as an addictive disorder, beyond the conceptual precision to which all scientific knowledge aspires, has clear implications for health and, more specifically, for disease prevention. And this is the case because it is understood that it is gambling and, more specifically, the activity of betting, which is ultimately responsible for a mental illness that can cause financial, personal and family ruin for those affected. For this reason, preventive activities must of necessity grapple with and control the cause of the problem; that is to say, gambling.

Gambling, however, is an economic activity involving businesses and social agents, as well as the government itself. Betting company earnings come from the amounts gamblers bet, although it would be more exact to say from what they lose. So much so that betting is organised in such a way that the more betting possible, the greater the

■ *Received: October 2022; Accepted: October 2022.*

■ **Send correspondence to:**
Mariano Chóliz Montañés. Universidad de Valencia, España.
Email: mariano.choliz@uv.es

■ ISSN: 0214-4840 / E-ISSN: 2604-6334

revenues of the firms, since in all cases the mathematical expectation, or expected value, will always favour whoever controls the bets.

Thus, we find ourselves with an unavoidable conflict of interest. On the one hand, betting companies earn greater revenues when more gambling is available and socially sanctioned. On the other, gambling is an activity that can cause addiction; that is to say, a disease characterised by an uncontainable urge to bet. The problem is that the more a person gambles, the greater the probability not only of losing money but also of developing a mental disorder. A tragic vicious cycle for the gambler and a lucrative virtuous cycle for betting companies.

In a society like the one we find ourselves in, advertising and marketing strategies usually play a key role in promoting consumption. The desirable aspects of the product for sale are magnified and negative ones are minimised, and it is expected that the good in question will be consumed.

And this is the crux of the problem since betting is a toxic product, if we understand toxicity as the potential of an element to cause damage to the body when an interaction between the two occurs. Nothing would happen to a person if they did not bet. Only when one places a bet does the roulette start – Russian roulette.

What happened when bingo halls, machines and casinos were legalised in Spain, back in 1977, was that advertising was restricted, with the pre-constitutional legislator deeming that gambling incurred risks and that it was not advisable to promote the activity to an excessive extent. At the beginning of this century, however, online gambling emerged and was controlled by foreign firms since at that time there were no regulations in Spain that would allow it. However, not only was the product marketed without the mandatory authorisations for this commercial activity, but it was accompanied from the start by advertising campaigns and marketing techniques that, because they were prohibited, some forms of legal gambling, such as casinos, bingo or slot machine halls lacked. In fact, the Supreme Court itself ruled in 2017 that the firms who had been operating online gambling before Law 13/2011 had been doing so illegally.

Finally, Law 13/2011, which regulated gambling, legalised online betting, and the first licenses to operate were granted in July 2012. After this, the online betting market intensified even more, both in terms of supply and promotion, which led to a continuous rise in spending on this type of gambling (DGOJ, 2022). This gave rise to a public health problem as online gambling addiction grew (Chóliz, 2016; Chóliz, Marcos & Lázaro-Mateo, 2021), a problem which has been particularly serious in the case of adolescents or minors (Chóliz & Marcos, 2022).

Despite article 7.2 of the Gambling Law stipulating that advertising should be regulated by the government, it took almost ten years and three regulatory attempts for said regulation to come into effect through Royal Decree 958/2020 on the marketing of gambling activities. This is a clear example of the difficulty involved is the legislation of gambling, as revealed in an editorial in this journal (Chóliz & Sáiz-Ruiz, 2016).

This royal decree is currently at risk of being null and void if the Constitutional Court rules in favour of the question of unconstitutionality raised by the Supreme Court against article 7.2 of Law 13/2011. The issue arose from the challenge presented by the Spanish online gambling industry federation, JDigital, which sees gambling regulation as a limitation of its constitutional right to freedom of enterprise.

Without entering into a discussion of strictly legal issues, such as whether regulating advertising is really an attack on the freedom of enterprise – when it is clearly encouraging an activity that can generate toxic effects – or whether a royal decree is the appropriate regulatory framework to restrict said right – when it is clearly a business activity whose profits derive directly from what gamblers lose – what we know that the High Court should take into account is that gambling is the key cause behind the development of a mental disorder, and this is a health issue. And when this activity is promoted at every level of society through advertising and marketing, mental illness becomes a public health problem.

Given the existence of such a conflict of rights, to freedom of enterprise and to public health, both included in the Constitution, the right to health should prevail. While the freedom of enterprise may be a constitutional right, the right to health, in addition to being present in article 43 of the Spanish Constitution of 1978, is also included in article 25 of the Universal Declaration of Human Rights. In a democratic state of law, citizens must be protected by their institutions.

References

APA, American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorder, Fifth Edition (DSM-5)*. Washington, DC: American Psychiatric Association Pub.

APA, American Psychiatric Association. (1980). *Diagnostic and Statistical Manual of Mental Disorder, Third Edition (DSM-III). Washington, DC:* American Psychiatric Pub.

Chóliz, M. (2016). The challenge of online gambling: The effect of legalization on the increase in online gambling addiction. *Journal of Gambling Studies, 32*, 749–756. doi:10.1007/s10899-015-9558-6.

Chóliz, M. & Marcos, M. (2022). "That's no country for 'young' men": A critical perspective on responsible online gambling policies for gambling disorder prevention in Spanish minors. *Journal of Gambling Issues, 49*, 158-173. doi:10.4309/jgi.2022.49.7.

Chóliz, M., Marcos, M. & Lázaro-Mateo, J. (2021). The risk of online gambling: A study of gambling disorder prevalence rates in Spain. *International Journal of Mental Health and Addiction*, *19*, 404-417.

Chóliz, M. & Sáiz-Ruiz, J. (2016). ¿Por qué (también) es tan difícil legislar sobre juego en España? Un 'déjà vu' de lo ocurrido con el alcohol. *Adicciones, 28,* 189-193. doi:10.20882/adicciones.886.

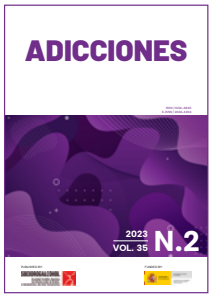
DGOJ, Dirección General de Ordenación del Juego (2022). *Mercado del juego online estatal.* Retrieved at https://www.ordenacionjuego.es/es/mercado-juego-online-estatal.html.

OMS (1978). *The ICD-9 classification of mental and behavioural disorders*. Geneva: WHO.

OMS (2018). *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death, 11th Revision.* Retrieved at https://icd.who.int/browse11/l-m/en#/http%3a%2f%2fid.who.int%2ficd%2fentity%2f499894965.

SOCIDROGALCOHOL
Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y las otras Toxicomanías

ADICCIONES
2023 ■ VOL. 35 ■ N. 2 ■ PAGES 95–106



ORIGINAL

Differences between substance-induced psychotic disorders and non-substance-induced psychotic disorders and diagnostic stability

Diferencias y estabilidad diagnóstica entre trastornos psicóticos inducidos por sustancias y trastornos psicóticos no inducidos

Julia Cambra Almerge*; Sergio Sánchez-Romero**; Francisco Arias Horcajadas*.

* Servicio de Psiquiatría, Hospital Universitario 12 de Octubre, Madrid, España.
** Servicio de Psiquiatría, Hospital Universitario Fundación Alcorcón, Madrid, España.

Abstract

Several hypotheses have been proposed to explain the comorbidity between psychotic disorders and substance use, one of them being the capacity of some to induce psychotic symptoms, although the transition from psychotic episodes induced by substances to schizophrenia has been less studied. In this study, differential variables between patients with induced and non-induced psychosis are determined, and the evolution and change of diagnosis of those induced to schizophrenia in the follow-up is analyzed. This is an observational case-control study with 238 patients admitted to the acute care unit for psychotic episodes between December 2003 and September 2011. The group of non-substance-induced psychotic disorders (NSIPD) included 127 patients, with 111 in the substance-induced (SIPD) group, according to the International Classification of Diseases. Sociodemographic and clinical characteristics, personal and family history, substance use, diagnostic stability and progression were compared. The NSIPD group showed higher scores in severity and in negative symptoms and more family history of psychosis. The SIPD group presented more personal history of personality disorder and family history of addictions and more positive symptoms At 6 years of follow-up, 40.9% of ISDP changed to a diagnosis of schizophrenia, presenting more family history of psychotic disorders and worse progression with more visits to the emergency department and readmissions, than subjects who maintained diagnostic stability. Therefore, special attention should be paid to this group of patients because of the potential severity and the increased risk of developing a chronic psychotic disorder.

Key words: substance-induced psychotic disorder, psychosis, addiction, schizophrenia, diagnostic stability

Resumen

Se han propuesto distintas hipótesis para explicar la comorbilidad entre trastornos psicóticos y por consumo de sustancias, siendo una de ellas la capacidad de algunas de inducir cuadros psicóticos, aunque la transición de episodios psicóticos inducidos por sustancias a esquizofrenia ha sido menos estudiada. En este trabajo se determinan variables diferenciales entre individuos con psicosis inducidas y no inducidas, y se analiza la evolución y el cambio de diagnóstico de las inducidas a esquizofrenia en el seguimiento. Es un estudio observacional de casos y controles con 238 pacientes ingresados en la unidad de agudos de un Hospital General de Madrid (España) por episodios psicóticos entre diciembre de 2003 y septiembre de 2011. Se incluyeron 127 en el grupo de trastornos psicóticos no inducidos por sustancias (TPNIS) y 111 en el de inducidos por sustancias (TPIS), según la Clasificación Internacional de Enfermedades. Se compararon características sociodemográficas, clínicas, antecedentes personales y familiares, de consumo de sustancias, estabilidad diagnóstica y evolución. El grupo de TPNIS presentó mayores puntuaciones en gravedad y sintomatología negativa mientras que el de TPIS tuvo más antecedentes personales de trastorno de personalidad y familiares de adicciones, y más sintomatología positiva. A los seis años un 40,9% de TPIS cambió a diagnóstico de esquizofrenia, presentando más antecedentes familiares de trastornos psicóticos y de adicciones, y una peor evolución con más visitas a urgencias y reingresos que los sujetos con estabilidad diagnóstica. Por tanto, habrá que prestar especial atención a este grupo de sujetos por su potencial gravedad y por el mayor riesgo de desarrollar un trastorno psicótico crónico.

Palabras clave: trastorno psicótico inducido por sustancias, psicosis, adicción, esquizofrenia, estabilidad diagnóstica

■ *Received: February 2019; Accepted: May 2020.*

■ ISSN: 0214-4840 / E-ISSN: 2604-6334

■ **Send correspondence to:**
Julia Cambra Almerge. Servicio de Psiquiatría. Hospital Universitario 12 de Octubre. Avda. de Córdoba s/n. 28041, Madrid, Spain.
Email: julia.cambra@salud.madrid.org

The relationship between substance use and psychotic disorders continues to be debated in academic and clinical circles (Mathias, Lubman & Hides, 2008), despite the well-known potential of drugs of abuse, including alcohol, cannabis or cocaine, to induce psychotic symptoms in vulnerable people (Paparelli, Di Forti, Morrison & Murray, 2011; Rognli, Berge, Håkansson & Bramness, 2015; Soyka, 2008; Zawilska & Wojcieszak, 2013). The use of psychoactive substances can trigger psychotic symptoms of different types, including acute intoxication, withdrawal, intoxication or withdrawal delirium, affective disorders with substance-induced psychotic symptoms and substance-induced psychotic disorders (SIPD) (Keshavan & Kaneko, 2013). SIPD has been described as a group of psychotic phenomena appearing when a psychoactive substance is used or in the two weeks following use, persisting for at least 48 hours and not lasting more than six months (World Health Organization, 1992). Symptoms sometimes remain despite cessation of use (Chen et al., 2003; Schuckit, 2006). It is difficult for clinicians to distinguish between primary or non-substance-induced psychotic disorders (NSIPD) and comorbid substance-use disorders, and SIPDs (Mathias et al., 2008).

It has been shown that the regular use of psychoactive substances, especially cannabis, can induce psychotic experiences which are usually transitory in nature (Gage, Hickman & Zammit, 2016) and linked to the development of schizophrenia in vulnerable individuals (Callaghan et al., 2012; Fonseca-Pedrero, Lucas-Molina, Pérez-Albéniz, Inchausti & Ortuño-Sierra, 2020; García Álvarez, Gomar, García-Portilla & Bobes, 2019; Semple, McIntosh & Lawrie, 2005). Comorbid substance use disorder is present in 55% of first psychotic episodes (Abdel-Baki, Ouellet-Plamondon, Salvat, Grar & Potvin, 2017; Myles, Myles & Large, 2015), and significant comorbidity is in turn also found between schizophrenia and substance use disorders (Caton et al., 2005), with cannabis being the most studied drug. With regard to other psychoactive substances, it has been argued that although alcohol dependence predicts psychotic experiences, it does not cause psychosis per se (Soyka, 2008). Similarly, although amphetamine-induced psychosis is well documented, the extent to which amphetamine contributes as a cause of schizophrenia itself remains doubtful (Chaudhury, Krishna, & Kumar, 2016). Research on cocaine and opioids as a risk factor for schizophrenia is limited (Gregg, Barrowclough & Haddock, 2007).

Thus, the ability to distinguish between primary and substance-induced psychosis is important in understanding the development of the disease and planning adequate treatment, particularly in the early stages (Arias et al., 2013; Fiorentini et al., 2011). Some studies have focused on investigating risk factors, both sociodemographic and clinical, which explain the diagnostic instability of SIPD (Caton et al., 2007; Mathias et al., 2008; Mauri, Di Pace, Reggiori, Paletta & Colasanti, 2017; Niemi-Pynttäri et al., 2013; Sara, Burgess, Malhi, Whiteford & Hall, 2014; Starzer, Nordentoft & Hjorthøj, 2018), reaching the conclusion that there is likely no specific psychopathology of induced psychotic disorders (Baldacchino et al., 2012; Chaudhury et al., 2016).

In some cases, chronic psychoses will develop after psychoactive substance-induced psychoses; however, the risk factors associated with SIPDs for inducing permanent mental disorder are unclear (Chen, Hsieh, Chang, Hung, & Chan, 2015). Studies examining the diagnostic stability of first psychotic episodes have yielded mixed results (Fusar-Poli et al., 2016), the influence of drug use on the progression from induced psychoses to schizophrenia has hardly been researched, and in the majority of studies substance use is usually a criterion for exclusion (Pedrós, Martí, Gutiérrez, Tenias & Ruescas, 2009). However, in recent years, several investigations have been carried out to assess the conversion of SIPD to schizophrenia or bipolar disorder. (Alderson et al., 2017; Chen et al., 2015; Mauri et al., 2017; Niemi-Pynttäri et al., 2013; Sara et al., 2014; Shah, Chand, Bandawar, Benegal & Murthy, 2017; Starzer et al., 2018). Four of them found a heightened risk of conversion to schizophrenia from SIPD (Alderson et al., 2017; Chen et al., 2015; Niemi-Pynttäri et al., 2013; Sara et al., 2014; Starzer et al., 2018), with varying results. Alderson et al. (2017) reported a 17.3% risk of changing to schizophrenia within 5 years, with half such cases occurring in the first two years and 80% in the first 5 years after the diagnosis of substance-induced psychosis. Sara et al. (2014) found a 46% conversion rate to schizophrenia in 11 years of follow-up, and a cohort investigation at 11 years of follow-up reported figures of 22.5% (Chen et al., 2015). On the other hand, an investigation comparing SIPD, NSIPD and comorbid substance use disorder found similar percentages of diagnostic stability and schizophrenia diagnosis at follow-up (Mauri et al., 2017). By substance, it has been suggested that the cumulative risk of conversion from SIPD to schizophrenia spectrum disorders may be 46% for cannabis, 30% for amphetamines and 5% for alcohol, with conversion occurring within three years (Niemi-Pynttäri et al., 2013). However, research aimed at studying the variables influencing the relationship between cannabis use and the risk of psychosis is scarce (Fonseca-Pedrero et al., 2020), which also occurs with other substances.

The distinction between substance-induced psychosis and primary psychotic disorder is important because of the different approaches to treatment required. Nevertheless, there are few studies on the differences between the two conditions and on the longitudinal diagnostic stability in individuals with substance-induced psychosis. The objective of this study was thus to compare sociodemographic and clinical characteristics, as well as personal and family history of psychiatry and use of psychoactive substances, between subjects

with substance-induced psychotic disorders and those with non-induced psychotic disorders to find out the proportion of individuals with SIPD whose diagnosis changed to schizophrenia and to study the progression. We hypothesise that there will differences between individuals with induced and primary psychoses, although research results are currently mixed, and that the group with induced psychoses which change diagnosis will present a worse progression.

Method

Participants

This is an observational study of cases and controls, with the cases comprising a group of patients with substance-induced psychotic disorders (SIPD), and the controls a group of subjects with non-substance-induced psychotic disorders (NSIPD) without substance abuse or dependence, excluding tobacco. A total of 238 individuals took part, with 127 in the NSIPD group diagnosed as schizophrenia free (F20) according to the International Classification of Diseases (ICD-10), of whom 51 had nicotine dependence. The group of SIPD subjects included 111 participants, 71 (68.3%) with psychotic disorder due to cannabinoid use (F12.5), 14 (13.5%) with psychotic disorder due to cocaine use (F14.5), three (2.9%) with a psychotic disorder due to alcohol (F10.5), and 16 (15.4%) with a psychotic disorder due to polydrug use or other psychotropic substances (F19.5). The ages of the SIPD group ranged from 18 to 50 years, with a mean of 29.64 years (SD = 7.21), while the NSIPD group was aged 18 to 72 years, with a mean of 40.61 years (SD = 13.23).

Sociodemographic and clinical characteristics, as well as personal and family psychiatric history and use of addictive substances, diagnostic stability and progression were analyzed.

Study procedure

Subjects admitted to the acute unit of the Fundación Alcorcón University Hospital (Madrid) with psychotic episodes were recruited prospectively in the period between November 2003 and September 2011, subject to meeting inclusion criteria and agreeing to participate by signing the informed consent. Those who were assigned to the main researcher were selected. This sample was considered representative of the total number of individuals hospitalized for psychotic episodes since all were consecutively assigned on admission to the psychiatrists of the unit, including the principal researcher.

The inclusion criteria were being older than 18 years of age, living in the Fundación Alcorcón University Hospital's health area, having had a psychotic episode with psychiatric hospitalization between November 2003 and September 2011, and not suffering from comorbid organic brain pathology. The exclusion criteria were belonging to another health area, presenting comorbid organic brain pathology and rejecting participation or not signing the informed consent. In the NSIPD group, in addition to the above, the presence of substance use disorder, except tobacco, was an exclusion criterion.

Sociodemographic variables, personal and family history, and substance use data were obtained during hospitalization when the patients were recruited, through an initial clinical interview on the first day of admission between the main investigator (experienced psychiatrist from the unit), the patient, and his relatives when these were available. This first interview also included an assessment of psychotic symptoms with the Positive and Negative Syndrome Scale (PANSS) for schizophrenia and of severity with the Global Clinical Impressions scale (CGI). In the final clinical interview before discharge, the main investigator diagnosed personality disorder, substance addiction, if any, or psychotic disorder, according to ICD-10 diagnostic criteria.

The follow-up variables were collected periodically until November 2011 and retrospectively and cross-sectionally in June 2017 through the systematic review of computerized medical records. The final diagnosis, substance use and follow-up variables, such as the number of hospitalizations or visits to the emergency department in the period between November 2011 and June 2017, were obtained from the annotations in the computerized medical record of the reference professionals and from the successive emergency department visits and psychiatric hospitalizations. Since the Fundación Alcorcón University Hospital is the principal hospital for this health area, patients usually go to there in case of emergency or for psychiatric admission, so the computerized history includes all episodes. A total of 27 subjects were excluded for declining to participate and not signing informed consent; two cases were lost due to death from organic causes, ten changed addresses, and among the rest there was a high rate of missing data for variables.

To assess diagnostic stability, the SIPD group was divided into one labelled "stable diagnosis" and another "changing diagnosis", depending on whether or not their diagnosis remained the same as on recruitment.

Measurement instruments

- Positive and Negative Syndrome Scale for Schizophrenia (PANSS): Developed by Kay, Fiszbein and Opler (Kay, Fiszbein & Opler, 1987) and adapted to Spanish by Peralta and Cuesta (1994), this is one of the most widely used instruments for assessing symptomatology in patients diagnosed with schizophrenia. It is a hetero-applied scale using a semi-structured interview of about 45 minutes in length. In its original version it is made up of 30 items grouped into three factors: positive syndrome (consisting of 7 items), negative syndrome (7 items) and general psychopathology (16 items). Scores for each item range from

1 (absent), 2 (minimal), 3 (mild), 4 (moderate), 5 (moderate-severe), 6 (severe), and 7 (extreme). The main psychometric properties are currently well documented (Kay, Opler & Lindenmayer, 1989; Kay & Sevy, 1990). Wallwork, Fortgang, Hashimoto, Weinberger and Dickinson (2012) proposed a five-factor model for the PANSS with factors labelled "positive," "negative," "cognitive," "depressed," and "excited." In a Spanish study, internal consistency for the five-factor model ranged from 0.59 (excited factor) to 0.90 (negative factor). Although the internal consistency of the excited factor is below the usually accepted limit of 0.70, being close to 0.60 it is an acceptable limit for short scales (Rodríguez-Jiménez et al., 2013).

- Global Clinical Impression Scale (CGI): This is used to assess the severity of the patient's disease, assessing the subject's psychopathology on four subscales: positive, negative, cognitive, depressive symptoms and an overall psychopathology score. Scores range from 0 to 7 points, with higher scores indicating greater severity (Kadouri, Coeeuble & Falissard, 2007).

Ethical aspects

Participation in the study was voluntary, hence all participants gave consent to participate in the project. The study was approved by the clinical research ethics committee (CEIC) of the Fundación Alcorcón University Hospital (Madrid) and funded by the National Plan on Drugs.

Statistical analysis

Means and standard deviations were used as descriptive statistics for quantitative variables, and frequencies for the qualitative ones. The quantitative variables were compared using Student's *t*-test, once they were found to be normal with the Kolmogorov-Smirnov test, and taking into account variance homogeneity using the Levene test. The *chi*-square test was used to compare the qualitative variables and, in cases where the conditions for this test were not met, Fisher's exact test was applied. For data analysis, the IBM Statistical Package for the Social Sciences (SPSS), version 23 (IBM SPSS, IBM Corp, Armonk, NY) was used. Statistical significance was set at $p < 0.05$ and degrees of freedom and effect sizes were calculated.

Results

Comparative analysis of SIPD and NSIPD

Sociodemographic data is shown in Table 1. Table 2 describes the comparison of the characteristics of disorder onset and the symptoms assessed using the PANSS and ICG scales. Family history of substance addiction and psychotic disorder are compared in Table 3. Diagnoses of personality disorder were higher in the SIPD group, as shown in Table 4, with statistically significant differences ($c^2 = 40.61$; $p < 0.01$) and 19.8% of personality disorders in the NSIPD group and 57.7% in the SIPD group. Table 5 shows substance use in subjects with SIPD at the time of recruitment.

Diagnostic stability and progression

Of the 44 subjects in the SIPD group from whom diagnostic data were obtained at follow-up, 18 (40.9%) changed diagnoses to NSIPD (comprising the "changing diagnosis" group), while 26 (59.1%) remained as SIPD ("stable diagnosis"). In the NSIPD group, 37 subjects had nicotine addiction and one was an occasional smoker. Substance use results for the SIPD group by diagnostic stability are detailed in Table 6, and the comparison of family history and follow-up variables in Table 7.

Discussion

The mean age of SIPD group cases was 29.64 years, while that of the NSIPD group was 40.61 years. This may be explained by the inclusion in the study of patients with chronic psychotic disorders of longer duration than in SIPD since this is not a study of first psychotic episodes. One study (Singal, Bhat, Srivastava & Prakash, 2015) obtained a mean age of 31.52 for their group of primary psychoses and 37.47 years for that of substance-induced psychosis, figures differing from the present study, which includes first psychotic episodes. Caton et al., (2005) found lower figures of 25 and 29 years respectively because they studied patients with psychosis in early stages. Males were significantly older than females in the SIPD group, which is consistent with previous studies (Seddon et al., 2016; Weibell et al., 2013). In the sociodemographic variables of marital status, cohabitation and type of residence, no statistically significant differences were found. Educational level was significantly higher in the SIPD group, in line with results of other research showing that this group of patients has higher scholastic achievement (Caton et al., 2007; Singal et al., 2015; Weibell et al., 2013). One study found that 89% of individuals with SIPD had secondary school level, compared to 64% of NSIPD (Singal et al., 2015). Unemployment affected 47.7% of the patients with SIPD, which may be a result of their worse overall functioning due to substance use and comorbidity with personality disorders. The number of pensioners is high in the NSIPD group probably because as they are more chronically ill, they had already been awarded a disability pension. No statistically significant differences were found in the age of first symptoms, initial diagnosis or first admission. The duration of the first psychiatric hospitalization was significantly longer for subjects with NSIPD than for patients with SIPD. This may be due to the fact that psychotic symptoms are usually transient in induced psychoses (Gage et al., 2016) and abate more rapidly during hospitalization and when psychoactive substance use ceases.

Table 1. ***Sociodemographic characteristics.***

		NSIPD n (%)	SIPD n (%)	c^2	p
Sex	Male	66 (52%)	98 (88.3%)	36.47	0.01
	Female	61 (48%)	13 (11.7%)		
Marital status	Single	86 (69.9%)	69 (69.7%)	0.12	0.94
	Married/with partner	27 (21.9%)	23 (23.2%)		
	Other	10 (8.2%)	7 (7.1%)		
Living arrangements	Birth family	66 (54.5%)	60 (61.2%)	5.64	0.23
	Own family	31 (25.6%)	21 (21.4%)		
	Alone	18 (14.9%)	9 (9.2%)		
	Institution	4 (3.3%)	2 (2.1%)		
	Other	2 (1.7%)	6 (6.1%)		
Level of education	No school	5 (4.5%)	2 (2.9%)	21.84	0.01
	Primary	71 (63.4%)	37 (54.4%)		
	Secondary	23 (20.5%)	23 (33.9%)		
	University	13 (11.6%)	6 (8.8%)		
Work situation	Homemaker	21 (17.6%)	7 (8%)	67.24	0.01
	Unemployed	18 (15.1%)	42 (47.7%)		
	Employed	19 (16.0%)	29 (33.0%)		
	Self-employed	32 (26.9%)	1 (1.1%)		
	Pensioner	26 (21.9%)	2 (2.3%)		
	Student	3 (2.5%)	6 (6.9%)		
	Other	0 (0.0%)	1 (1.1%)		
Residence	Urban	99 (80.5%)	68 (72.3%)	1.99	0.16
	Rural	24 (19.5%)	26 (27.7%)		

Table 2. ***Comparative analysis of characteristics of disorder onset, the Positive and Negative Syndrome Scale for Schizophrenia (PANSS) and the Global Clinical Impression Scale (CGI).***

	NSIPD Mean (SD)	SIPD Mean (SD)	t	df	p	d
Age of first psychiatric symptomsa	24.6 (8.33)	26.3 (6.42)	-1.67	196.65	0.09	-0.23
Age of diagonis[a]	26.9 (9.32)	27.4 (6.61)	-0.48	178.83	0.63	-0.07
Age of first hospitalization[a]	30.2 (11.74)	27.9 (6.73)	1.76	180.35	0.08	0.23
Duration of first hospitalization[b]	19.9 (13.96)	13.3 (9.67)	4.07	203.55	0.01	0.52
PANSS-P	22.36 (7.49)	24.73 (5.53)	-2.55	189.95	0.01	-2.34
PANSS-N	23.60 (8.45)	12.53 (5.84)	10.69	184.31	0.01	11.07
PANSS-G	37.30 (9.47)	34.39 (0.53)	1.92	110.89	0.06	0.33
CGI	4.76 (0.71)	4.51 (0.53)	2.43	157	0.02	0.38

Note. a: years; b: days; df: degrees of freedom; d: Cohen's d; P: positive; N: negative; G: global.

Table 3. ***Comparative analysis of family history.***

Family history		NSIPD n (%)	SIPD n (%)	c^2	p	OR (CI 95%)
Psychotic disorder	Yes	21 (21.2%)	14 (21.2%)	0.00	0.99	1.01 (0.472.16)
	No	78 (78.8%)	52 (78.8%)			
Substance use disorder	Yes	13 (13.1%)	19 (28.8%)	6.21	0.01	2.67 (1.21-5.89)
	No	86 (86.9%)	47 (71.2%)			

Note. OR: Odds ratio; CI: Confidence interval.

Table 4. ***Percentages of personality disorder diagnosis in both groups.***

Personality disorder diagnosis	NSIPD n (%)	SIPD n (%)
Paranoid personality disorder (F60.0)	1 (1.1%)	2 (2.9%)
Schizoid personality disorder (F60.1)	7 (7.7%)	3 (4.4%)
Dissocial personality disorder (F60.2)	0 (0.0%)	2 (2.9%)
Emotional instability personality disorder (F60.3)	1 (1.1%)	16 (23.5%)
Histrionic personality disorder (F60.4)	0 (0.0%)	0 (0.0%)
Anankastic personality disorder (F60.5)	2 (2.2%)	0 (0.0%)
Anxious personality disorder (F60.6)	1 (1.1%)	1 (1.5%)
Dependent personality disorder (F60.7)	0 (0.0%)	0 (0.0%)
Other specific personality disorders (F60.8)	0 (0.0%)	0 (0.0%)
Unspecified personality disorder (F60.9)	6 (6.6%)	16 (23.5%)

Table 5. ***SIPD group substance use at admission.***

Substance type and level of use		n (%)
Tobacco	Not used	4 (5.1%)
	Occasional	1 (1.3%)
	Dependent	73 (93.6%)
Alcohol	Not used	41 (41.4%)
	Occasional	21 (21.2%)
	Dependent	37 (37.4%)
Cannabis	Not used	14 (13.9%)
	Occasional	1 (1.0%)
	Dependent	86 (85.2%)
Cocaine	Not used	53 (50.0%)
	Occasional	16 (15.1%)
	Dependent	37 (34.9%)
Opioids	Not used	90 (90.0%)
	Dependent	10 (10.0%)

Table 6. ***Comparison of substance use in the six-year follow-up.***

		Stable diagnosis n (%)	Changed diagnosis n (%)	c^2 / F	df	p
Nicotine dependence	No	26 (33.3%)	8 (36.4%)	0.34	1	0.85
	Yes	52 (66.7%)	15 (63.6%)			
Alcohol dependence	No	72 (92.3%)	17 (77.3%)	3.96	1	0.61
	Yes	6 (7.7%)	5 (22.7%)			
Cannabis dependence	No	68 (87.2%)	18 (81.8%)	0.41	1	0.50
	Yes	10 (12.8%)	4 (18.2%)			
Cocaine dependence	No	75 (96.2%)	21 (95.5%)	0.02	1	0.99
	Yes	3 (3.8%)	1 (4.5%)			
Opioid dependence	No	78 (100%)	21 (95.5%)	3.58	1	0.22
	Yes	0 (0.0%)	1 (4.5%)			

Note. df: degrees of freedom.

Table 7. ***Diagnostic stability: family history and progression.***

		Stable diagnosis	Changed diagnosis	c^2 / t	df	p	OR (CI 95%) / d
Family history of substance dependence[a]	No	76 (88.4%)	13 (59.1%)	10.34	1	0.01	5.26 (1.79-15.43)
	Si	10 (11.6%)	9 (40.9%)				
Family history of psychotic disorder[a]	No	72 (82.8%)	13 (59.1%)	5.73	1	0.02	3.23 (1.20-9.18)
	Si	15 (17.2%)	9 (40.9%)				
Hospitalizations in 6 years of follow-up[b]		0.6 (1.14)	1.8 (2.30)	-2.49	27.91	0.02	-1.15
Emergency visits in 6 years of follow-up[b]		1.3 (2.56)	2.6 (2.76)	-2.24	135	0.03	-1.27

Note. a: N (%); b: Mean (SD); df: degrees of freedom; d: Cohen's d; OR: Odds ratio; Ci: Confidence Interval.

A diagnosis of comorbid personality disorder was made with 57.7% of the patients in the SIPD group, with unstable personality disorder being the most frequent together with unspecified personality disorder, followed by schizoid, paranoid and dissocial disorders. In NSIPD, only 19.8% were diagnosed with a personality disorder, with schizoid disorder being the most frequent. These results are in line with the literature, which indicates that personality disorder diagnoses are more frequent in individuals with SIPD (Arias et al., 2013), especially antisocial disorders (Caton et al., 2005, 2007; Fiorentini et al., 2011), compared to the schizoid disorders most commonly associated with a schizophrenia diagnosis (Núñez & Gurpegui, 2002). It can be hypothesized that the presence of a personality disorder, especially those characterized by a high degree of impulsiveness and emotional instability, can predispose to substance use, which, in turn, could trigger psychosis in vulnerable subjects, or that these disorders have common brain substrates and mechanisms (Volkow, 2001). Therefore, it is essential to explore the presence of substance use and the existence of psychotic symptoms in individuals with personality disorders.

Patients with SIPD had greater family history of substance use disorder, with statistically significant differences compared to the NSIPD group, in line with previous research showing that a family history of substance abuse is predictive of SIPD (Caton et al., 2005, 2007). In contrast, no differences were found in the family history of psychotic disorder, which differs from the literature since it has been observed that individuals with primary psychosis have greater family history of mental illness (Caton et al., 2005, 2007). Singal et al. (2015) observed a family history of psychosis in 20% of NSIPD cases, double that of patients with induced psychosis. Therefore, the presence of a family history of psychosis should be taken into account in these SIPD patients since they could be at higher risk of progressing to schizophrenia.

Individuals in the SIPD group scored significantly higher on positive symptoms, while those with NSIPD had higher scores for negative symptoms and severity. This fact could be due to the presence in the NSIPD group of patients with chronic psychoses of greater progression, in which the presence of negative symptoms and greater seve-

rity can be expected, compared to induced psychoses. The findings in this regard in the literature are contradictory since on the one hand, it has been pointed out that SIPD have higher scores on positive symptoms than NSIPD (Caton et al., 2005; Fraser, Hides, Philips, Proctor & Lubman, 2012; Weibell et al., 2013), while on the other, that the latter would score higher in both positive and negative symptoms (Myles, Newall, Nielssen & Large, 2012; Seddon et al., 2016), with some even finding no differences (Møller & Linaker, 2004; Tosato et al., 2013).

In the following six years, 40.9% of the individuals belonging to the SIPD group changed to a diagnosis of schizophrenia. Various studies have provided figures for the diagnostic transition from substance-induced psychosis to schizophrenia of between 17% and 50% (Alderson et al., 2017; Arendt, Rosenberg, Foldager, Perto & Munk-Jorgensen, 2005; Chen et al., 2015; Crebbin, Mitford, Paxton & Turkington, 2009; Mauri et al., 2017; Niemi-Pynttäri et al., 2013; Sara et al., 2014; Shah et al., 2017; Starzer et al., 2018), so the results of the present study are in line with the literature.

When comparing the groups "stable diagnosis" and "changing diagnosis", greater family history of psychotic disorder and addiction were found in those whose diagnosis change, which matches previous studies (Singal et al., 2015). Various explanations have been put forward for this diagnostic change from SIPD to NSIPD. On the one hand, it may be that certain individuals are particularly vulnerable to the sympathomimetic effects of substances (Singal et al., 2015) and end up developing a chronic psychotic disorder; on the other, it could be due to underdiagnosis of NSIPD in patients with both psychosis and substance use disorder; or that substance use disorder is a marker of emerging psychotic disorder which has not yet manifested with psychotic symptoms (Singal et al., 2015). The patients with SIPD whose diagnosis changed in the last six years of follow-up had worse progression with more readmissions and visits to the emergency room than the group that remained stable; this had already been indicated as factors of worse prognosis (Caton et al., 2007; Chaudhury et al., 2016). On the other hand, no statistically significant differences were found in terms of substance use between the group that changed diagnosis and the one remaining stable, which is probably due to the decrease in the sample for analysis since the substance use data in the years of follow-up were not duly recorded in the medical records. Based previous research, it could have been expected that patients with a change in diagnosis, with a worse progression with more visits to the emergency department and hospitalizations, would present greater substance use (Abdel-Baki et al., 2017; Latt et al., 2011).

This study is not without limitations. First, the comparison of patients with episodes of substance-induced psychosis and patients diagnosed with schizophrenia is a limiting factor when establishing differences in symptomatology at admission, given that it is predominantly negative among individuals diagnosed with schizophrenia and could be due to the progression of the disease itself. Future lines of research could consider the study of patients with first episodes. A second limitation is be the missing data in both groups as a result of incomplete data collection regarding some variables in the medical records, such as substance use or change of diagnosis, when monitored by outpatient psychiatrists in an unstructured manner. This should lead us to reflect on the extent to which important parameters such as such substance use are explored and noted in check-ups of patients with chronic disorders, especially those individuals who have had episodes of induced psychotic disorders. Third, given that the sample of cases is from a specific health area and involved hospitalized patients, and despite the fact that recruitment was carried out consecutively, the results cannot be extrapolated to other clinical contexts and health areas.

Despite the limitations, a strength of this study is the structured baseline assessment to establish differences between the groups of induced and non-induced psychosis since, to our knowledge, little research has focused on this point. In addition, the follow-up time is longer than that of other studies aimed at assessing diagnostic stability in induced psychotic disorders. Finally, attempts were made to assess substance use in order to determine its influence on diagnostic stability, despite the large volume of missing data, which serves as a pointer for future research. In terms of clinical recommendations, substance use should be explored at each check-up visit and correspondingly noted as part of clinical history, and changes in diagnosis should be indicated when they occur, especially in cases of SIPD. For future research, it would be interesting to study first psychotic episodes, both induced and non-induced, gathering data systematically on baseline use and progression, and the time of diagnosis change, which allows the assessment of the influence of such use on diagnostic stability and the search for predictors of chronification. Finally, these findings underscore the need for periodic reassessment of clinical diagnoses to ensure that patients receive appropriate interventions.

Funding

This study was supported by the National Plan on Drugs Order SAS/3031/2009, of October 26.

Conflicts of interest

The authors declare no conflicts of interest.

Acknowledgments

This study was carried out as a Master's thesis at the Complutense University of Madrid, with the participation of

the 12 de Octubre University Hospital and the Fundación de Alcorcón University Hospital.

References

Abdel-Baki, A., Ouellet-Plamondon, C., Salvat, É., Grar, K. & Potvin, S. (2017). Symptomatic and functional outcomes of substance use disorder persistence 2 years after admission to a first-episode psychosis program. *Psychiatry Research, 247*, 113-119. doi:10.1016/j.psychres.2016.11.007.

Alderson, H. L., Semple, D. M., Blayney, C., Queirazza, F., Chekuri, V. & Lawrie, S. M. (2017). Risk of transition to schizophrenia following first admission with substance-induced psychotic disorder: a population-based longitudinal cohort study. *Psychological Medicine, 47*, 2548-2555. doi:10.1017/S0033291717001118.

Arendt, M., Rosenberg, R., Foldager, L., Perto, G. & Munk-Jorgensen, P. (2005). Cannabis-induced psychosis and subsequent schizophrenia-spectrum disorders: follow-up study of 535 incident cases. *The British Journal of Psychiatry, 187*, 510-515. doi:10.1192/bjp.187.6.510.

Arias, F., Szerman, N., Vega, P., Mesías, B., Basurte, I., Morant, C., … Babín, F. (2013). Estudio Madrid sobre prevalencia y características de los pacientes con patología dual en tratamiento en las redes de salud mental & de atención al drogodependiente. *Adicciones, 25*, 118-127.

Baldacchino, A., Hughes, Z., Kehoe, M., Blair, H., Teh, Y., Windeatt, S. & Crome, I. B. (2012). Cannabis psychosis: examining the evidence for a distinctive psychopathology in a systematic and narrative review. *The American Journal on Addictions, 21*, S88-98. doi:10.1111/j.1521-0391.2012.00295.x.

Callaghan, R. C., Cunningham, J. K., Allebeck, P., Arenovich, T., Sajeev, G., Remington, G., … Kish, S. J. (2012). Methamphetamine use and schizophrenia: a population-based cohort study in California. *American Journal of Psychiatry, 169*, 389-396. doi:10.1176/appi.ajp.2011.10070937.

Cantor-Graae, E., Nordström, L. G. & McNeil, T. F. (2001). Substance abuse in schizophrenia: a review of the literature and a study of correlates in Sweden. *Schizophrenia Research, 48*, 69-82. doi:10.1016/s0920-9964(00)00114-6.

Caton, C. L., Drake, R. E., Hasin, D. S., Dominguez, B., Shrout, P. E., Samet, S. & Schanzer, B. (2005). Differences between early-phase primary psychotic disorders with concurrent substance use and substance-induced psychoses. *Archives of General Psychiatry, 62*, 137-145. doi:10.1001/archpsyc.62.2.137.

Caton, C. L., Hasin, D. S., Shrout, P. E., Drake, R. E., Dominguez, B., First, M. B., … Schanzer, B. (2007). Stability of early-phase primary psychotic disorders with concurrent substance use and substance-induced psychosis. *The British Journal of Psychiatry, 190*, 105-111. doi:10.1192/bjp.bp.105.015784.

Chambers, R. A., Krystal, J. H. & Self, D. W. (2001). A neurobiological basis for substance abuse comorbidity in schizophrenia. *Biological Psychiatry, 50*, 71-83. doi:10.1016/s0006-3223(01)01134-9.

Chaudhury, S., Krishna, S. T. & Kumar, A. B. (2016). Impact of substance use disorder on presentation of schizophrenia. *Dual Diagnosis Open Access, 1*, 7. doi:10.21767/2472-5048.100007.

Chen, C. K., Lin, S. K., Sham, P. C., Ball, D., Loh, E. W., Hsiao, C. C., … Murray, R. M. (2003). Pre-morbid characteristics and co-morbidity of methamphetamine users with and without psychosis. *Psychological Medicine, 33*, 1407-1414. doi:10.1017/S0033291703008353.

Chen, W. L., Hsieh, C. H., Chang, H. T., Hung, C. C. & Chan C. H. (2015). The epidemiology and progression time from transient to permanent psychiatric disorders of substance-induced psychosis in Taiwan. *Addictive Behaviors, 47*, 1-4. doi:10.1016/j.addbeh.2015.02.013.

Crebbin, K., Mitford, E., Paxton, R. & Turkington, D. (2009). First-episode drug-induced psychosis: a medium term follow up study reveals a high-risk group. *Social Psychiatry and Psychiatric Epidemiology, 44*, 710-715. doi:10.1007/s00127-008-0490-2.

Fiorentini, A., Volonteri, L. S., Dragogna, F., Rovera, C., Maffini, M., Mauri, M. C. & Altamura, C. A. (2011). Substance-induced psychoses: a critical review of the literature. *Current Drug Abuse Reviews, 4*, 228-240. doi:10.2174/1874473711104040228.

Fonseca-Pedrero, E., Lucas-Molina, B., Pérez-Albéniz, A., Inchausti, F. & Ortuño-Sierra, J. (2020). Psychotic-like experiences and cannabis use inadolescents from the general population. *Adicciones, 32*, 41-51. doi:10.20882/adicciones.1149.

Fraser, S., Hides, L., Philips, L., Proctor, D. & Lubman, D. I. (2012). Differentiating first episode substance induced and primary psychotic disorders with concurrent substance use in young people. *Schizophrenia Research, 136* 110-115. doi:10.1016/j.schres.2012.01.022.

Fusar-Poli, P., Cappucciati, M., Rutigliano, G., Heslin, M., Stahl, D., Brittenden, Z., … Carpenter, W. T. (2016). Diagnostic stability of ICD/DSM first episode psychosis diagnoses: meta-analysis. *Schizophrenia Bulletin, 42*, 1395-1406. doi:10.1093/schbul/sbw020.

Gage, S. H., Hickman, M. & Zammit, S. (2016). Association between cannabis and psychosis: epidemiologic evidence. *Biological Psychiatry, 79*, 549–56. doi:10.1016/j.biopsych.2015.08.001.

García Álvarez, L., Gomar, J. J., García-Portilla, M. P. & Bobes, J. (2019). Cannabis use and cognitive impairment in schizophrenia and first-episodepsychosis. *Adicciones, 31*, 89-94. doi:10.20882/adicciones.1328.

Gregg, L., Barrowclough, C. & Haddock, G. (2007). Reasons for increased substance use in psychosis. Clinical *Psychology Review, 27*, 494-510. doi:10.1016/j.cpr.2006.09.004.

IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.

Kadouri, A., Coeeuble, E. & Falissard B. (2007). The improved Clinical Global Impression Scale (iCGI): development and validation in depression. *BMC Psychiatry, 7*, 1. doi: 10.1186/1471-244X-7-7.

Kay, S. R., Fiszbein, A. & Opler, L. A. (1987). The positive and negative syndrome scale (PANSS) for schizophrenia. *Schizophrenia Bulletin, 13*, 261-276. doi:10.1093/schbul/13.2.261.

Kay, S. R., Opler, L. A. & Lindenmayer, J. P. (1989). The Positive and Negative Syndrome Scale (PANSS): rationale and standardisation. *British Journal of Psychiatry. Supplement, 7*, 59-67.

Kay, S. R. & Sevy, S. (1990). Pyramidical model of schizophrenia. *Schizophrenia Bulletin, 16*, 537-545. doi:10.1093/schbul/16.3.537

Keshavan, M. S. & Kaneko Y. (2013). Secondary psychoses: an update. *World Psychiatry, 12*, 4-15. doi:10.1002/wps.20001.

Khantzian, E. J. (1997). The self-medication hypothesis of substance use disorders: a reconsideration and recent applications. *Harvard Review of Psychiatry, 4*, 231-244. doi:10.3109/10673229709030550.

Latt, N., Jurd, S., Tennant, C., Lewis, J., Macken, L., Joseph, A., … Long, L. (2011). Alcohol and substance use by patients with psychosis presenting to an emergency department: changing patterns. *Australasian Psychiatry, 19*, 354-359. doi:10.3109/10398562.2011.579971.

Mathias, S., Lubman, D. I. & Hides, L. (2008). Substance-induced psychosis: a diagnostic conundrum. *The Journal of Clinical Psychiatry, 69*, 358-367. doi:10.4088/jcp.v69n0304.

Mauri, M. C., Di Pace, C., Reggiori, A., Paletta, S. & Colasanti, A. (2017). Primary psychosis with comorbid drug abuse and drug-induced psychosis: diagnostic and clinical evolution at follow up, *Asian Journal of Psychiatry, 29*, 117-122. doi:10.1016/j.ajp.2017.04.014.

Møller, T. & Linaker, O. M. (2004). Symptoms and lifetime treatment experiences in psychotic patients with and without substance abuse. *Nordic Journal of Psychiatry, 58*, 237-242. doi:10.1080/08039480410006296.

Moshe, L. B., Weizman, A., Ben, D. H., Konas, S., Fischel, Z., Aizenberg, D., … Valevski, A. (2018). Differences in demographic and clinical characteristics between cannabis users and non-drug users: a retrospective study of patients with first hospitalization due to psychotic symptoms, *Psychiatry Research, 268*, 454-459. doi:10.1016/j.psychres.2018.07.037.

Myles, N., Newall, H., Nielssen, O. & Large, M. (2012). The association between cannabis use and earlier age at onset of schizophrenia and other psychoses: meta-analysis of possible confounding factors. *Current Pharmaceutical Design, 18*, 5055-5069. doi:10.2174/138161212802884816.

Myles, H., Myles, N. & Large, M. (2015). Cannabis use in first episode psychosis: Meta-analysis of prevalence, and the time course of initiation and continued use. *Australian and New Zealand Journal of Psychiatry, 50*, 208-219. doi:10.1177/0004867415599846.

Niemi-Pynttäri, J. A., Sund, R., Putkonen, H., Vorma, H., Wahlbeck, K. & Pirkola, S.P. (2013). Substance-induced psychoses converting into schizophrenia: a register-based study of 18,478 Finnish inpatient cases. *The Journal of Clinical Psychiatry, 74*, e94-9. doi:10.4088/JCP.12m07822.

Núñez, L. A. & Gurpegui, M. (2002). Cannabis-induced psychosis: a cross-sectional comparison with acute schizophrenia. *Acta Psychiatrica Scandinavica, 105*, 173-178. doi:10.1034/j.1600-0447.2002.1o079.x.

Organización Mundial de la Salud. (1992). CIE-10. *Trastornos Mentales y del Comportamiento. Décima Revisión de la Clasificación Internacional de las Enfermedades. Descripciones Clínicas y pautas para el diagnóstico*. Ginebra: Organización Mundial de la Salud.

Paparelli, A., Di Forti, M., Morrison, P. D. & Murray, R. M. (2011). Drug-induced psychosis: how to avoid star gazing in schizophrenia research by looking at more obvious sources of light. *Frontiers in Behavioral Neuroscience, 5*, 1. doi:10.3389/fnbeh.2011.00001.

Pedrós, A., Martí, J., Gutiérrez, G., Tenías, J. M. & Ruescas, S. (2009). Two-year diagnostic stability and prognosis in acute psychotic episodes. *Actas Españolas de Psiquiatría, 37*, 245-251.

Peralta, V. & Cuesta, M. J. (1994). Psychometric properties of the positive and negative syndrome scale (PANSS) in schizophrenia. *Psychiatry Research, 53*, 31-40. doi:10.1016/0165-1781(94)90093-0.

Rodríguez-Jiménez, R., Bagney, A., Mezquita, L., Martínez-Gras, I., Sánchez-Morla, E. M., Mesa, N., … Palomo, T. (2013). Cognition and the five-factor model of the positive and negative syndrome scale in schizophrenia. *Schizophrenia Research, 143*, 77-83. doi:10.1016/j.schres.2012.10.020.

Rognli, E. B., Berge, J., Håkansson, A. & Bramness, J. G. (2015). Long-term risk factors for substance-induced and primary psychosis after release from prison. A longitudinal study of substance users. *Schizophrenia Research, 168*, 185-190. doi:10.1016/j.schres.2015.08.032.

Sara, G. E., Burgess, P. M., Malhi, G. S., Whiteford, H. A. & Hall, W. C. (2014). The impact of cannabis and stimulant disorders on diagnostic stability in psychosis. *The Journal of Clinical Psychiatry, 75*, 349-356. doi:10.1016/j.schres.2015.08.032.

Schuckit, M. A. (2006). Comorbidity between substance use disorders and psychiatric conditions. *Addiction, 101 (Suppl 1)*, 76-88. doi:10.1111/j.1360-0443.2006.01592.x.

Seddon, J. L., Birchwood, M., Copello, A., Everard, L., Jones, P. B., Fowler, D., … Sing, S. P. (2016). Cannabis use is associated with increased psychotic symptoms and poorer psychosocial functioning in first-episode psychosis: a report from the UK national EDEN study. *Schizophrenia Bulletin, 42*, 619-625. doi:10.1093/schbul/sbv154.

Semple, D. M., McIntosh, A. M. & Lawrie, S. M. (2005). Cannabis as a risk factor for psychosis: systematic review. *Journal of Psychopharmacology, 19*, 187-194. doi:10.1177/0269881105049040.

Shah, D., Chand, P., Bandawar, M., Benegal, V. & Murthy, P. (2017). Cannabis induced psychosis and subsequent psychiatric disorders. *Asian Journal Psychiatry, 30*, 180-184. doi:10.1016/j.ajp.2017.10.003.

Singal, A., Bhat, P. S., Srivastava, K. & Prakash, J. (2015). The study of primary psychotic disorders with concurrent substance abuse in terms of their diagnostic stability. *Indian Journal of Psychiatry, 57*, 224-228. doi:10.4103/0019-5545.166638.

Soyka, M. (2008). Prevalence of alcohol-induced psychotic disorders. *European Archives of Psychiatry and Clinical Neuroscience, 258*, 317-318. doi:10.1007/s00406-008-0767-1.

Starzer, M. S. K., Nordentoft, M. & Hjorthøj, C. (2018). Rates and predictors of conversion to schizophrenia or bipolar disorder following substance-induced psychosis. *American Journal of Psychiatry, 175*, 343-350. doi:10.1176/appi.ajp.2017.17020223.

Thirthalli, J. & Benegal, V. (2006). Psychosis among substance users. *Current Opinion in Psychiatry, 19*, 239-245. doi:10.1097/01.yco.0000218593.08313.fd.

Tosato, S., Lasalvia, A., Bonetto, C., Mazzoncini, R., Cristofalo, D., De Santi, K., … Ruggeri, M. (2013). The impact of cannabis use on age of onset and clinical characteristics in first-episode psychotic patients. Data from the Psychosis Incident Cohort Outcome Study (PICOS). *Journal of Psychiatric Research, 47*, 438-444. doi:10.1016/j.jpsychires.2012.11.009.

Wallwork, R. S., Fortgang, R., Hashimoto, R., Weinberger, D. R. & Dickinson, D. (2012). Searching for a consensus five-factor model of the Positive and Negative Syndrome Scale for schizophrenia. *Schizophrenia Research, 137*, 246-250. doi:10.1016/j.schres.2012.01.031.

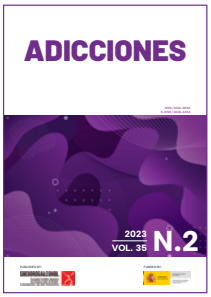
Weibell, M. A., Joa, I., Bramness, J., Johannessen, J. O., McGorry, P. D., Ten Velden Hegelstad, W. & Larsen, T. K. (2013). Treated incidence and baseline characteristics of substance induced psychosis in a Norwegian catchment area. *BMC Psychiatry, 1*3, 319. doi:10.1186/1471-244X-13-319.

Volkow, N. D. (2001). Drug abuse and mental illness: progress in understanding comorbidity. *American Journal of Psychiatry, 158*, 1181-1183. doi:10.1176/appi.ajp.158.8.1181.

Zawilska, J. B. & Wojcieszak, J. (2013). Designer cathinones-an emerging class of novel recreational drugs. *Forensic Science International, 231*, 42-53. doi:10.1016/j.forsciint.2013.04.015.

SOCIDROGALCOHOL
Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y las otras Toxicomanías

ADICCIONES
2023 ■ VOL. 35 ■ N. 2 ■ PAGES 107–118
www.adicciones.es



ORIGINAL

Problematic Internet use and Internet gaming disorder: Overlap and relationship with health-related quality of life in adolescents

Uso problemático de Internet y trastorno de juego por Internet: Solapamiento y relación con la calidad de vida relacionada con la salud en adolescentes

Juan Manuel Machimbarrena*, Marta Beranuy**, Esperanza Vergara-Moragues***, Liria Fernández-González****, Esther Calvete****, Joaquín González-Cabrera*****.

* Faculty of Psychology. University of the Basque Country (UPV/EHU), Donostia, Spain.
** Faculty of Health Sciences. Public University of Navarre (UPNA), Pamplona, Spain.
*** Faculty of Education. Complutense University of Madrid, Madrid, Spain.
**** Faculty of Psychology and Education, University of Deusto, Bilbao, Spain.
***** Faculty of Education. International University of la Rioja (UNIR), Logroño, Spain.

Abstract

General Problematic Internet Use (GPIU) is a dysfunctional use of Internet handling and management in general. In contrast, Internet Gaming Disorder (IGD) is a specific behaviour linked to online videogames. Both problems are becoming common in adolescents, but they have hardly been studied simultaneously, and the joint relationship of the two constructs with Health-Related Quality of Life (HRQoL) is unknown. The general objective of this study is to analyse the relationship between GPIU and IGD and their association with HRQoL. The study is analytical and cross-sectional with 2,024 participants (46.4% boys, n = 939) from 16 schools of 7 Spanish regions. The mean age and standard deviation were 14.20±1.42, with a range of 11-18 years. The Spanish versions of the KIDSCREEN-10, the Revised Generalized and Problematic Internet Use Scale 2 and the Internet Gaming Disorder Scale were used. Of the total sample evaluated, 15.5% of the participants had high levels of GPIU, and 3.3% of video game players presented IGD. The dimensions of GPIU are strongly associated with those of IGD. HRQoL correlated significantly and negatively with all the dimensions of GPIU and IGD (p <.001). Participants who reported problems with GPIU or IGD, individually or conjointly, had significantly lower scores in HRQoL than those with no problems.

Keywords: problematic Internet use, Internet gaming disorder, health-related quality of life, adolescents, negative consequences

Resumen

El Uso problemático general de Internet (GPIU) supone un uso disfuncional del manejo y la gestión de Internet en general. En cambio, el Trastorno de juego por Internet (IGD) es una conducta específica vinculada a los videojuegos en línea. Ambos problemas comienzan a ser frecuentes en adolescentes, pero apenas han sido estudiados simultáneamente ni se conoce el papel conjunto de ambos constructos sobre Calidad de vida relacionada con la salud (CVRS). El objetivo general de este estudio es analizar la relación entre el GPIU y el IGD y su asociación con la CVRS. El estudio es analítico y transversal con 2024 participantes (46,4% chicos, n = 939) procedentes de 16 colegios en 7 regiones españolas. La media de edad y desviación típica fue de 14,20±1,42 en un rango de 11-18 años. Se usaron las versiones españolas del KIDSCREEN-10, del *Revised Generalized and Problematic Internet Use Scale* 2 y del *Internet Gaming Disorder Scale*. Un 15,5% del total de la muestra evaluada reportó niveles altos de GPIU y un 3,3% de los jugadores de videojuegos presentó IGD. Las dimensiones del GPIU están altamente asociadas a las del IGD. La CVRS correlacionó significativa y negativamente con todas las dimensiones del GPIU y del IGD (p < ,001). Los participantes que reportaron problemas en el GPIU o el IGD, individual o conjuntamente, presentan puntuaciones significativamente más bajas en la CVRS.

Palabras clave: uso problemático de Internet, trastorno de juego por Internet, calidad de vida relacionada con la salud, adolescentes, consecuencias negativas

■ *Received: February 2020; Accepted: December 2020.*

■ ISSN: 0214-4840 / E-ISSN: 2604-6334

■ **Send correspondence to:**
Dr. Joaquín González-Cabrera. Facultad de la Educación, Universidad Internacional de La Rioja (UNIR). Avenida de la Paz, 137, 26006 Logroño, España. Email: joaquin.gonzalez@unir.net

The conceptualization of inadequate Internet use has been explained in several different ways over the last two decades, adapting to the technological changes in society. Therefore, the literature has gathered different constructs measured with different assessment tools such as the "Internet Addiction" (Young, 1996), the "Compulsive Use of Internet" (Greenfield, 1999), the "Problematic Internet Use" (PIU; Davis, 2001), or the "Generalized Problematic Internet Use" (GPIU; Caplan, 2002, 2010).

Within this last category, we highlight the proposals of Davis (2001) and Caplan (2002, 2010). They were the first to propose a distinction between General Problem Internet Use (GPIU), referring to the global set of online behaviors, and Specific Problematic Internet Use (SPIU), indicating the specific use of the Internet for a purpose (e.g., videogames or social media). Regarding GPIU, Caplan's theoretical model hypothesizes that preference for online social interaction and online mood regulation increases the likelihood of poor self-regulation, which in turn leads to negative consequences in various areas of the individual's life (social, academic, work, health, etc.) (Caplan, 2010).

Epidemiological studies indicate that around 15% of adolescents show problematic use of the Internet and/or Smartphone (Cha & Seo, 2018; Gómez, Rial, Braña, Golpe & Varela, 2017; Machimbarrena et al., 2018; Muñoz-Miralles et al., 2016; Yudes-Gómez, Baridon-Chauvie & González-Cabrera, 2018). In terms of gender, there is no consensus. Some works indicate that GPIU is higher in boys (Durkee et al., 2012; Laconi, Tricard & Chabrol, 2015; Munno et al., 2017), whereas others state that it is higher in girls (Gómez et al., 2017; López-Fernández, 2018; Machimbarrena et al., 2018, 2019; Yudes-Gómez et al., 2018). This lack of consensus also affects the variable age during adolescence, with some studies suggesting that students aged 16-18 have more PIU than those between the ages of 10-13 (Gómez et al., 2017; Machimbarrena et al., 2019). Some studies also find no differences between pre-adolescence (10-14 years) and adolescence (15-18 years) (Yudes-Gómez et al., 2018) or in university samples (Carbonell, Chamarro, Oberst, Rodrigo & Prades, 2018). Likewise, PIU manifestation is differential depending on the country, with the range of problems varying between 14.3% in Germany and 54.9% in England (with a value of 23.7% for Spain) (Laconi et al., 2018).

Although GPIU is configured as a construct of the dysfunctional use of the Internet in general, new realities have emerged that focus on more specific problems (SPIU) such as the *Internet Gaming Disorder* (IGD), which has recently been included in section III of the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; (American Psychiatric Association, 2013). IGD is described as an addictive disorder without substance whose essential characteristic is participation in online videogames recurrently and persistently over time, which leads to clinically significant distress (Carbonell, 2014). IGD includes the characteristics of addiction model (Griffiths, 2005), such as salience, mood modification, tolerance, withdrawal, personal/social/academic/work conflicts and relapse. According to a meta-analysis performed with adolescent sample, the mean prevalence of IGD is 4.6%, with a higher percentage among males (6.8%) than among females (1.3%) (Fam, 2018). In addition, prevalences across countries vary and are higher in Asia and the US than in Europe (Fam, 2018). In particular, in Spain, the prevalence of IGD has a broad range, between 1.9% (Beranuy et al., 2020) and 8.3%, (Buiza-Aguado, Alonso-Canovas, Conde-Mateos, Buiza-Navarrete & Gentile, 2018) with higher scores for boys than for girls. Finally, most studies find higher prevalence of IGD in young age groups (15-21 years) than in older groups (Fam, 2018).

As for the relationship between the two concepts, GPIU and IGD, the research carried out is very scarce and has produced mixed results. For example, one study found a weak relationship between the two concepts (López-Fernández, 2018), whereas others have found a higher association between GPIU and SPIU (Caplan, Williams & Yee, 2009; Cudo, Kopiś, Stróżak & Zapala, 2018; Laconi et al., 2015). These preliminary results indicate the need to delve into the relationship and overlap of these two constructs.

On another hand, both constructs can have a negative impact on health and well-being. GPIU has been associated with numerous psychosocial and physical and mental health problems (Aznar-Díaz, Kopecký, Romero-Rodríguez, Cáceres-Reche & Trujillo Torres, 2020; Beranuy-Fargues, Chamarro, Graner & Carbonell, 2009; Machimbarrena et al., 2019). The same goes for problems related to online videogames and issues such as depression, anxiety, social phobias, and sleep disorders (Gentile, Coyne & Walsh, 2011; Kim, Namkoong, Ku & Kim, 2008; Thomée, Härenstam & Hagberg, 2011). Overall, current research has addressed the negative effects of GPIU and IGD on different variables, but few studies have focused on biopsychosocial variables such as Health-Related Quality of Life (HRQoL). HRQoL refers not only to the absence of diseases or conditions, but to a state of complete physical, mental, and social well-being that is perceived by the subjects themselves and by those around them (Wallander & Koot, 2016). The few existing studies indicate that inadequate use of the Internet is related to low HRQoL scores, as well as to lower perceived social support and more friends known only over the Internet (Barayan, Al Dabal, Abdelwahab, Shafey & Al Omar, 2018; Machimbarrena et al., 2019; Takahashi et al., 2018; Wartberg, Kriston & Kammerl, 2017). In the same vein, other works analyzing constructs such as personal satisfaction or psychological adjustment associate

them negatively with the inappropriate use of the Internet and online videogames (Buiza-Aguado et al., 2018; Kojima et al., 2019; Lemmens, Valkenburg & Gentile, 2015).

The above review shows the relevance of GPIU and IGD to adolescent health and well-being. However, little is known about the possible overlap between the two problems, and the potential cumulative impact on HRQoL. Consistent with these antecedents, the objectives of this study are: 1) to analyze the prevalences of GPIU and IGD; 2) to study the association between the dimensions of GPIU and IGD; 3) to examine the relationship of GPIU and IGD jointly with HRQoL; 4) to examine sex- and age-related differences in GPIUS and IGD. In relation to the hypotheses, we expect the prevalence data to be similar to those from other studies of both GPIU (Machimbarrena et al., 2018, 2019) and IGD (Beranuy et al., 2020; Fuster, Carbonell, Pontes & Griffiths, 2016). We also expect that GPIU and IGD will be positively and significantly associated with each other (Caplan et al., 2009; Cudo et al., 2018; Laconi et al., 2015; Lam, 2014). In addition, we expect that participants who present GPIU and IGD problems conjointly will have poorer HRQoL than participants with a single problem or none, as previous studies indicate that the sum of risks on the Internet implies a decrease in quality of life (Buiza-Aguado et al., 2018; González-Cabrera et al., 2019; Takahashi et al., 2018; Wartberg et al., 2017). On another hand, we expect that the components related to dysfunctions in emotion regulation and to the negative consequences (which are shared by the two problems) will be the most strongly associated with HRQoL (Caplan, 2010). Finally, in relation to sex, we expect no sex differences in GPIU (Yudes-Gómez et al., 2018), but we expect more IGD problems in boys (Fam, 2018) and worse HRQoL scores in girls (Machimbarrena et al., 2019; Vélez-Galárraga, López-Aguilà & Rajmil, 2009). Finally, higher GPIU scores and lower HRQoL scores are expected in older participants (Gómez et al., 2017; Machimbarrena et al., 2019; The Kidscreen Group Europe, 2006).

Method

Design and Participants

An analytical and cross-sectional study was performed between April and June of 2018. The sample was made up of 2,024 participants, of whom 46.4% were boys (n = 939) and 53.6% were girls (n = 1085). The mean age and standard deviation were 14.20±1.42, with a range of 11-18 years. Of the sample, 35.2% (n = 712) was between 11 and 13 years old, 46.5% (n = 941) was between 14 and 15 years, and 18.3% (n = 371) was between 16 and 18 years. Although attempts were made to ensure the representativeness of the school levels with the participation of 16 schools in seven Spanish regions (Aragón, Asturias, Basque Country, Castilla la Mancha, Castilla-León, Madrid and Valencia), the sampling was non-probabilistic.

Instruments

The participants provided information about demographic variables such as sex, grade, school, and age. For the analysis of the variables under study, the following instruments were used.

The Spanish version of the Generalized Problem Internet Use Scale (GPIUS2; Caplan, 2010; Gámez-Guadix, Orue & Calvete, 2013) was used for GPIU assessment. It consists of 15 items divided into four factors: (1) preference for online social interaction; (2) mood regulation; (3) negative consequences; and (4) poor self-regulation. Agreement with the items is rated on a six-point Likert scale, ranging from 1 (*completely disagree*) to 6 (*completely agree*). Participants were asked about their behavior in the last 5 months. The reliability obtained is shown in Table 2.

The Spanish version of Internet Gaming Disorder Scale, IGD-20, (Fuster et al., 2016; Pontes, Király, Demetrovics & Griffiths, 2014) was used to evaluate IGD. The questionnaire consists of 20 items that evaluate activity in online videogames during the last 12 months, through the dimensions of (Griffiths, 2005) addiction model mentioned in the introduction. It uses a five-point Likert scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The reliability obtained is shown in Table 2.

Finally, for the evaluation of HRQoL, we used the Spanish version of the KIDSCREEN-10 (The Kidscreen Group Europe, 2006) for children and adolescents aged 8 to 18 years. This version evaluates a global dimension across 10 items. It uses a 5-point Likert scale to rate agreement and/or frequency, ranging from 1 (*strongly disagree/never*) to 5 (*strongly agree/always*). This general HRQoL index collects key indicators of physical well-being, psychological well-being, autonomy, and relationship with parents, friends, and social support and school environment. The questionnaire provides a score for each participant in relation to the sample used for its standardization in Spain (The Kidscreen Group Europe, 2006). For KIDSCREEN-10, the mean scores varied around 50 (SD = 10) due to the standardization of the T-value. The reliability obtained for α and ω was .81.

Procedure

The questionnaires were applied in online format through Qualtrics. Participants responded to the questionnaires in computer classrooms coordinated by the orientation departments of each center and under the supervision of the classroom tutor, who had previously been trained for this purpose. The time required to complete the questionnaires ranged from 10 to 18 minutes.

Statistical Analysis

Firstly, to determine the internal consistency of the instruments used, Cronbach alphas and omega coefficients were

estimated. The former was obtained using the Statistical Package for the Social Sciences 23 (SPSS) (IBM Corp, 2015), and the latter using R software (R Development Core Team 3.0.1, 2013) program, and the Psych package (Revelle, 2015). The rest of the analyses were carried out with SPSS 23.

The criteria established in the literature were used for GPIU and IGD standardization. In the case of IGD, a cut-off point above 75 points established by Fuster et al. (2016) was considered. For GPIUS classification, the cut-off point was 52, following Machimbarrena et al. (2019).

For the first objective, the following analyses were performed: analysis of frequencies and chi-square for the contrast of proportions and analysis of adjusted standardized residuals. For the second objective, canonical correlations (CCA) were used. For the third objective, Welch's t for independent samples, Pearson correlations, and multiple regression analysis were carried out. For the last objective, we used central trend and dispersion measurements of the study variables, Welch's t for independent samples, and analysis of variance (Welch's *F*) with post-hoc Games-Howell comparisons. A value of less than $p = .05$ was considered significant.

Ethical Considerations

The study was carried out with the authorization of the participants, the schools, and the political-educational institution of the Autonomous Community. Through the official communication channels with the families, the schools sent a passive consent form that informed the parents/tutors about the purpose of the study and its characteristics, its promoters, and their right not to participate. Those parents/tutors who did not wish to allow participation returned the signed consent. This occurred in less than 1% of the sample. The favorable report of the Research Ethics Committee of the Principality of Asturias was obtained (Ref. 231/17).

Results

Prevalence Rate, Descriptive Analyses, and Correlations

Table 1 shows the prevalence of GPIU and IGD according to the aforementioned cut-off points. A significantly higher percentage of girls reported GPIU problems, whereas more boys presented IGD problems.

To analyze the multivariate-shared relationship between GPIU and IGD, a CCA was conducted using the four GPIUS dimensions as independent variables and the six IGD dimensions as criterion variables. This analysis produced four canonical functions, with only the first two functions yielding interpretable squared canonical correlation (Rc^2) effect sizes of 22.8% and 10.2%, respectively. The third and fourth functions explained less than 1% of the variance (0.7% and 0.3%, respectively) and were therefore omitted from interpretation.

To explore differences across sex, two sets of canonical correlations were performed for each sex. This procedure yielded similar results to those obtained with the overall sample (Wilks's $\Lambda = .572$ criterion, $F(24, 2760.68) = 19.94$, $p < .001$ for males; and Wilks's $\Lambda = .702$ criterion, $F(24, 2450.20) = 10.89$, $p < .001$ for females) and, therefore, only the results of the overall sampled are described. Collectively, the full model across all functions was statistically significant using the Wilks's $\Lambda = .685$ criterion, $F(24, 5244.55) = 25.03$, $p < .001$. Because Wilks's Λ represents the variance unexplained by the model, $1 - \Lambda$ yields the full model effect size in an r^2 metric (Henson, 2006). Thus, for the set of four canonical functions, the r^2 type effect size was .32, which indicates that the full model can explain a substantial portion, approximately 32%, of the variance shared by the variable sets.

The test of only Functions 2–4 was also statistically significant, Wilks's $\Lambda = .889$, $F(15, 4152.28) = 12.16$, $p < .001$, $Rc^2 = 11.2\%$. However, the tests of Functions 3-4 did not explain a high amount of variance shared by the

Table 1. ***Prevalence of each of the risks as a function of problem severity for the total sample and of sex.***

Construct	Problem Severity	Total *f* (%) *n* = 1977	Boys *f* (%) *n* = 914	Girls *f* (%) *n* = 1063	χ^2 *(p)*
General Problematic Internet Use	No problem	1670 (84.5)	791 (86.5) *	879 (84.5) **	5.56 (.018)
	Problem	307 (15.5)	123 (13.5) **	184 (15.5) *	
		Total *f* (%) *n* = 1437[1]	Boys *f* (%) *n* = 750	Girls *f* (%) *n* = 687	χ^2 *(p)*
Internet Gaming Disorder	No problem	1389 (96.7)	714 (495.29) **	675 (98.3) *	10.35 (.001)
	Problem	48 (3.3)	36 (4.8) **	12 (0.8) *	

Note. [1] 585 participants reported not playing videogames.
*Adjusted standardized residuals > 1.96. **Adjusted standardized residuals < -1.96.

Table 2. ***Canonical correlations between GPIU and IGD (GPIU, n = 1065; IGD, n = 729).***

		Function 1			Function 2					
	Variable	**Coef.**	***R***	***%r$_s^2$***	**Coef.**	**R**	***%r$_s^2$***	***h²***	**α**	**ω**
GPIU	POSI	-0.23	-.69	47.75	0.15	.28	7.78	55.53	.83	.83
	Mood Regulation	-0.18	-.68	45.56	1.07	**.71**	**49.70**	**95.27**	.84	.84
	Negative consequences	-0.65	**-.94**	87.61	-0.69	-.28	8.07	**95.68**	.81	.81
	Deficient self-regulation	-0.15	-.79	61.62	-0.23	-.04	0.14	61.76	.90	.90
	GPIU (Adequacy)			60.64			16.42	77.06		
	R_c^2			22.84			10.24			
	IGD (Adequacy)			78.18			6.92	85.10		
Internet Gaming Disorder	Salience	-0.20	-.88	77.97	-0.17	-.07	0.52	78.49	.77	.79
	Mood modification	-0.24	-.82	66.75	1.38	**.57**	**32.38**	**99.13**	.85	.85
	Tolerance	0.08	-.85	72.25	-0.11	-.07	0.52	72.77	.78	.78
	Withdrawal	-0.10	**-.90**	80.82	-0.13	-.09	0.72	81.54	.87	.87
	Conflict	-0.36	**-.93**	85.56	-0.67	-.26	6.50	**92.07**	.86	.86
	Relapse	-0.29	**-.93**	85.75	-0.17	-.09	0.86	86.61	.76	.77

Note. Coef. = standardized canonical function coefficient; r_s = structure coefficient; r_s^2 = squared structure coefficient or explained variance; h^2 =communalities across the two functions for each variable; POSI = Preference for Online Social Interaction; Adequacy = a measure of how the synthetic scores on a function behave when reproducing the variance in a set of variables. The most relevant structure coefficients are in bold type. α = Cronbach's alpha; ω = McDonald's Omega.

variable sets, Wilks's Λ = .989, $F(8, 3010) = 2.07$, $p = .035$, Rc^2= 1.1%, and Wilks's Λ = .996, $F(3, 1506.00) = 1.77$, $p = .150$, Rc^2 = 0.3%, respectively. Table 2 presents the standardized canonical function coefficients and structure coefficients for Functions 1 and 2. The squared structure coefficients are also given, as well as the communalities (h^2) across the two functions for each variable.

For Function 1 coefficients, the relevant criterion (IGD) variables were primarily Withdrawal, Conflict, and Tolerance, with correlations equal to or above .90, although the rest of the dimensions also make significant contributions. Furthermore, all of these variables' structure coefficients have the same sign, indicating that they are all positively related to each other. Concerning the independent variables in Function 1, the dimension Negative Consequences of the GPIU makes the largest contribution but the other three dimensions also make significant contributions, with values over .60. All the GPIU variables in the predictor set also share the same sign with each other and with the criterion variables, indicating that they are positively correlated.

Concerning Function 2, the coefficients suggest that the only criterion variable of relevance is Mood Modification, which is negatively correlated to the rest of the variables. As for GPIU, the Mood Regulation dimension makes the greatest contribution. The sign of the correlations shows that this dimension is negatively related to negative consequences and deficient self-regulation but positively correlated to Preference for social interaction and to the criterion variable Mood Modification.

Pearson correlations were also carried out to relate the total GPIU and IGD scores to HRQoL (r = -.354, $p < .001$;

Table 3. ***Differences in age (11-13, 14-15, and 16-18 years) in the studied constructs (n = 1977).***

	11-13 years[a] *n* = 705		**14-15 years[b] *n* = 922**		**16-18 years[c] *n* = 350**		***Welch's F***	**η²**	**Post hoc (Games-Howell)**
	M	*SD*	*M*	*SD*	*M*	*SD*			
General Problematic Internet Use	31.59	14.83	36.19	15.54	36.96	14.58	24.01***	.023	a<b; a<c
Internet Gaming Disorder	28.56	14.27	31.23	15.91	31.50	15.41	5.79***	.008	a<b; a<c
Health-related quality of life	48.61	8.60	45.94	8.16	43.66	7.55	48.91***	.045	a>b; a>c; b>c

Note. M = arithmetic mean; *SD* = standard deviation; η^2 = eta squared; *** = $p < .001$. All post hoc comparisons are significant at $p < .001$.

Table 4. ***Differences in health-related quality of life as a function of problem severity in General Problem Internet Use and Online Gaming Disorder based on the profile (no problems, problems only with GPIU, problems only with IGD, problems with GPIU and IGD).***

	Level of severity	**HRQoL** *M* (*SD*)	**Welch's** *t* **(Cohen's** *d***)**
General Problematic Internet Use (GPIU) (*n* = 1977)	No problems (*n* = 1670)	47.37 (8.26)	11.91*** (0.71)
	Problems (*n* = 307)	41.91 (7.20)	
Internet Gaming Disorder (IGD) (*n* = 1437)	No problems (*n* = 1389)	46.95 (8.10)	6.64*** (0.97)
	Problems (*n* = 48)	39.13 (8.01)	
			F (η^2) de Welch Post hoc
Overlap between GPIU and IGD (*n* = 1980)	No problems[a] (n = 1654)	47.73 (8.02)	53.61*** (.066) a>b, c, d b > d
	Problems only with GPIU[b] (*n* = 278)	42.32 (7.08)	
	Problems only with IGD[c] (*n* = 19)	40.89 (8.93)	
	Problems with GPIU+IGD[d] (*n* = 29)	37.98 (7.28)	

Note. CVRS = HRQoL = Health-Related Quality of Life; η^2 = eta squared; *M* = arithmetic mean; *SD* = standard deviation. *** = $p < .001$. All post hoc comparisons are significant at $p < .05$.

r = -.203, p < .001, respectively). All GPIU dimensions correlated significantly and inversely with HRQoL: Online Interaction Preference (r = -.219, p < .001), Mood Regulation (r = -.246, p < .001), Negative Consequences (r = -.308, p < .001) and Poor Self-Regulation (r = -.277, p < .001). The same situation occurs with the dimensions of the IGD: Salience (r = -.237, p < .001), Mood Modification (r = -.253, p < .001), Tolerance (r = -.233, p < .001), Withdrawal (r = -.272, p < .001), Conflict (r = -.272, p < .001), and Relapse (r = -.258, p < .001).

Globally, there were no differences in the GPIU scores between boys (M = 34.2, SD = 15.1) and girls (M = 35.01, SD = 15.5); t (1977) = -1.21, p = .226; however, significantly higher IGD scores were found in boys (M = 34.7, SD = 16.2) than in girls (M = 25.2, SD = 12.0), t (1569) = -13.14, p < .001, d = 0.66. In GPIU, the only difference was in the dimension of Poor Self-Regulation (t (1985) = -3.05; p = .002; d = 0.14), with girls obtaining higher scores. In the IGD, there were significant differences in all the dimensions, which were in all cases higher for boys than for girls. The dimensions with the greatest differences were Salience (t (1569) = 14.5 p < .001, d = 0.72) and Tolerance t (1567) = 12.99, p < .001, d = 0.65. In HRQoL, girls had worse scores: boys (M = 47.62, SD = 8.36) and girls (M = 45.48, SD = 8.31); t (2017) = 5.74, p = .001, d = 0.26).

In terms of differences as a function of age group, statistically significant differences were found for the three constructs (see Table 3). For both GPIU and IGD scores, the scores of participants aged 11-13 were lower than those of participants aged 14-15 and 16-18. The opposite occurred with HRQoL, where the highest scores were associated with the 11-13-year-old group, decreasing significantly in the older groups.

Table 5. ***Multiple Regression Analysis with Health-Related Quality of Life as Dependent Variable.***

	HRQoL				
	B	*SE*	β	*t*	*p*
Step 1					
Sex	-2,68	0,42	-0,16	-6,262	< ,001
Age	-1,01	0,13	-0,18	-7,89	< ,001
Adjusted R^2 *for Step 1*	,078				
Step 2					
Online interaction preference	-0.17	0.07	-0.07	-2.63	.009
Mood Regulation	-0.19	0.06	-0.10	-3.06	.002
Negative consequences	-0.44	0.08	-0.18	-5.49	< .001
Poor self-regulation	-0.03	0.04	-0.03	-0.93	.352
Salience	0.06	0.13	0.02	0.30	.762
Mood modification	-0.22	0.12	-0.06	-1.88	.061
Tolerance	0.15	0.14	0.05	1.20	.230
Withdrawal	-0.27	0.16	-0.08	-1.58	.114
Conflict	-0.06	0.12	-0.02	-0.43	.666
Relapse	0.00	0.12	0.00	-0.05	.961
Adjusted R^2 *for Step2*		.202			
F		32.39			

Note. '0' represents boys and '1' represents girls in the sex variable; *B* = non-standardized beta; *SE* = standard error; *β* = standardized beta.

Relationship of GPIU and IGD with HRQoL

Considering the total sample, 15.5% reported high levels of GPIU, and 3.3% of the video game players presented IGD. The participants who did not present either problem had a significantly higher score in HRQoL than those reporting problems (see Table 4). It can be seen that those who did not present problems are in the range of the reference values of the Spanish population standardized around 50 (*SD* = 10). In contrast, participants who were classified as having problems, either of GPIU or IGD, had a score in HRQoL nearly one standard deviation lower. In addition, approximately 1.47% (*n* = 29) of the sample presented problems both in GPIU and IGD, and these participants had the lowest scores in HRQoL. It should also be noted that 60.4% of participants with IGD problems also had GPIU.

Finally, a hierarchical regression analysis was carried out to identify which specific dimensions of the GPIU and the IGD are related to HRQoL (see Table 5). All dimensions of the GPIU and IGD were used as explanatory variables. The analyses showed that age, sex, preference for online social interaction, mood regulation, and negative consequences were statistically and significantly associated with HRQoL. No dimension of the IGD was significantly associated with HRQoL.

Discussion

The expansion of Internet use among adolescents has led to the development of new problematic behaviors. This study has examined the co-occurrence of Problematic Internet Use and Internet Gaming Disorder and provides evidence of their association with adolescents' health related quality of life.

Regarding the prevalence of GPIU and IGD, the results indicated that 15.5% of adolescents present GPIU. These values are convergent with those of other studies (Cha & Seo, 2018; Gómez et al., 2017; Machimbarrena et al., 2018, 2019; Yudes-Gómez et al., 2018). In addition, 3.3% exceed the cut-off point for the diagnosis of IGD. This figure is slightly lower than that of the meta-analysis on the prevalence of IGD (Fam, 2018), although it is within a similar range as that found by the authors of the IGD-20 (Fuster et al., 2016) and also slightly higher than that found with the Spanish version of the IGDS9-SF (Beranuy et al., 2020). Nonetheless, it is consistent with other studies carried out with the IGD-20 (Bernaldo-de-Quirós, Labrador-Méndez, Sánchez-Iglesias & Labrador, 2020).

As had been hypothesized, there is a significant and positive association between GPIU and IGD, which is in line with the findings of other studies (Caplan et al., 2009; Cudo et al., 2018; Laconi et al., 2015). The results of the canonical correlations provide very relevant evidence. In the first function, the most important variable is negative consequences, but in the second function, it is mood regulation. This is consistent with the profile study carried out by Machimbarrena et al. (2019) proposing four profiles: non-problematic, problem user, severe problem, and mood regulator. The last one is related to the second-function data, where the Internet is used to change one's mood, but which presents no negative consequences or poor self-regulation. On the contrary, the first function is related to problem users or users with severe problems, as there are negative consequences and poor self-regulation. This may be relevant for studies suggesting that mood regulation is important in the spontaneous remission of problematic Internet use (Wartberg & Lindenberg, 2020).

Beyond the above, as a specific contribution of this study, it should be noted that 2% (*n* = 29) of the participants who played videogames presented GPIU and IGD problems conjointly, and moreover, 60.4% of the participants who had IGD problems also presented GPIU. These data relate to the cumulative risk model of Evans, Li and Whipple (2013), which suggests analyzing the overlap or co-occurrence of different risks. This co-occurrence is related to worse indicators for health and psychological well-being than when only one of the problems is presented (González-Cabrera et al., 2019; Machimbarrena et al., 2018). Thus, our results showed that adolescents who presented both problems scored lower in HRQoL than those who did not have problems or who only had one of the two problems (confirming the study's hypothesis). This is a unique contribution of this study, and the findings are consistent with previous studies that have shown that the accumulation of risks is related to poorer HRQoL (Buiza-Aguado et al., 2018; González-Cabrera et al., 2019; Takahashi et al., 2018; Wartberg et al., 2017). The results also show that the GPIU dimensions (online social preference, poor self-regulation, and negative consequences) better explain the scores in HRQoL. These results therefore partially confirm the proposed hypothesis and are related to Caplan's (2010) model and to the Spanish version of the GPIUS2 carried out by Gámez-Guadix et al. (2013).

On another hand, the results revealed differences in the prevalence of the two problems as a function of sex and age. Thus, a higher percentage of boys had IGD, in line with the meta-analytic results of Fam (2018), whereas a higher number of girls presented GPIU problems. This can be explained particularly because boys are higher consumers of videogames, even if the trend is changing (Fam, 2018). These data confirm the proposed hypothesis regarding sex and IGD, but not with respect to GPIU, where we had hypothesized that there would be no differences, considering the conflicting results of previous studies. Our results add evidence to previous research that points to a greater number of girls who have GPIU problems (Gómez et al., 2017; López-Fernández, 2018; Machimbarrena et al., 2019; Yudes-Gómez et al., 2018). The differences

sex-related found in GPIU can be explained by different factors, the most likely being the use of different evaluation instruments and cut-off points in this context. Other explanations may focus on the fact that GPIU is associated with other specific Internet risks that were not assessed, such as nomophobia (which affects girls significantly, especially between ages 12 and 16) (León-Mejía, González-Cabrera, Calvete, Patino-Alonso & Machimbarrena, 2020). It may also be due to the use of differential technology in boys and girls (Tokunaga, 2017)

In terms of age, significant differences were found between the groups, with older participants obtaining higher scores in GPIU and IGD and lower scores in HRQoL. These results are in line with other studies (Gómez et al., 2017; The Kidscreen Group Europe, 2006) and confirm the study hypothesis. Higher scores in GPIU and IGD may be related to the increase in the consumption of Internet and of owing a mobile phone. In general, as adolescence progresses, the percentage increases each year. Thus, according to data from the INE (2019), at the age of 10 years, 79% of users owns a computer, and at age 15, the percentage is 93.6%. Also, at 10 years of age, 22.3% owns a mobile, reaching 93.8% at the age of 15. Online parental mediation practices are also more restrictive in early adolescence (9-12 years), and this potentially exposes the child to fewer risks (Martínez, Casado & Garitaonandia, 2020).

This study presents limitations: a) the study is cross-sectional, which prevents the establishment of directionality between the variables. Therefore, it would be appropriate in future research to design longitudinal studies; b) the study did not include other variables that could explain some of the relationships found. For example, having information about the stressors and the nature of adolescents' interpersonal relationships could help to understand the relationship between GPIU, IGD, and HRQoL; c) only self-reports were used, with the possible biases associated with their use. In the future, it would be of great interest to include hetero-reports (e.g., parents or teachers) to evaluate HRQoL and introduce clinical evaluation by an IGD specialist; d) the results could have been affected by retrospective bias; e) the maturative development of the participants was not evaluated; f) the sample, while broad and from different geographical areas, was obtained through non-probabilistic sampling.

The findings of this study may have relevant implications both for educators and for clinicians. When detecting a problem in one of these constructs, it would be relevant to evaluate the other one because of their close relationship. It is imperative for future prevention programs to address the risks of inadequate internet use conjointly and not just specifically. It would also be of great interest to include skills for conflict resolution and the development of adequate emotion and mood regulation through the Internet.

In conclusion, this study relates General Problematic Internet Use and the Internet Gaming Disorder in a sample of adolescents. In addition, relationships are established between the two constructs, and a lower health-related quality of life is shown, especially when the disorders occur together.

Acknowledgements

This research was funded by Spanish Ministry of Economy, Industry and Competitiveness, RTI2018-094212-B-I00: (CIBER-AACC), and by the International University of la Rioja, Project "Cyberpsychology (Trienio 2017-20)". It was also funded by the Basque Government (Ref. IT982-16).

Conflict of interests

The authors have no conflict of interest.

References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (5th ed.)*. Washington, DC: American Psychiatric Association. doi:10.1176/appi.books.9780890425596.

Aznar-Díaz, I., Kopecký, K., Romero-Rodríguez, J. M., Cáceres-Reche, M. P. & Trujillo Torres, J. M. (2020). Patologías asociadas al uso problemático de Internet. Una revisión sistemática y metaanálisis en WOS y Scopus. *Investigación Bibliotecológica: archivonomía, bibliotecología e información*, *34*, 229. doi:10.22201/iibi.24488321xe.2020.82.58118.

Barayan, S. S., Al Dabal, B. K., Abdelwahab, M. M., Shafey, M. M. & Al Omar, R. S. (2018). Health-related quality of life among female university students in Dammam district: Is Internet use related? *Journal of family & community medicine*, *25*, 20-28. doi:10.4103/jfcm.JFCM_66_17.

Beranuy, M., Machimbarrena, J. M., Vega-Osés, M. A., Carbonell, X., Griffiths, M. D., Pontes, H. M. & González-Cabrera, J. (2020). Spanish validation of the Internet Gaming Disorder scale–short form (IGDS9-SF): Prevalence and relationship with online gambling and quality of life. *International Journal of Environmental Research and Public Health*, *17*, 1562. doi:10.3390/ijerph17051562.

Beranuy-Fargues, M., Chamarro, A., Graner, C. & Carbonell, X. (2009). Validation of two brief scales for Internet addiction and mobile phone problem use. *Psicothema*, *21*, 480-485.

Bernaldo-de-Quirós, M., Labrador-Méndez, M., Sánchez-Iglesias, I. & Labrador, F. J. (2019). Instrumentos de medida del trastorno de juego en Internet en adolescentes

y jóvenes según criterios DSM-5: Una revisión sistemática. *Adicciones*, *32,* 291-230. doi:10.20882/adicciones.1277

Buiza-Aguado, C., Alonso-Canovas, A., Conde-Mateos, C., Buiza-Navarrete, J. J. & Gentile, D. (2018). Problematic video gaming in a young Spanish population: Association with psychosocial health. *Cyberpsychology, Behavior, and Social Networking*, *21*, 388-394. doi:10.1089/cyber.2017.0599.

Caplan, S. (2002). Problematic Internet use and psychosocial well-being: Development of a theory-based cognitive–behavioral measurement instrument. *Computers in Human Behavior*, *18*, 553-575. doi:10.1016/S0747-5632(02)00004-3.

Caplan, S. (2010). Theory and measurement of generalized Problematic Internet use: A two-step approach. *Computers in Human Behavior*, *26*, 1089-1097. doi:10.1016/j.chb.2010.03.012.

Caplan, S., Williams, D. & Yee, N. (2009). Problematic Internet use and psychosocial well-being among MMO players. *Computers in Human Behavior*, *25*, 1312-1319. doi:10.1016/j.chb.2009.06.006.

Carbonell, X. (2014). La adicción a los videojuegos en el DSM-5. *Adicciones*, *26*, 91-95. doi:10.20882/adicciones.10.

Carbonell, X., Chamarro, A., Oberst, U., Rodrigo, B. & Prades, M. (2018). Problematic use of the Internet and smartphones in University students: 2006–2017. *International Journal of Environmental Research and Public Health*, *15*, 475. doi:10.3390/ijerph15030475.

Cha, S. S. & Seo, B. K. (2018). Smartphone use and smartphone addiction in middle school students in Korea: Prevalence, social networking service, and game use. *Health Psychology Open*, *5*. doi:10.1177/2055102918755046.

Cudo, A., Kopiś, N., Stróżak, P. & Zapała, D. (2018). Problematic video gaming and problematic Internet use among Polish young adults. *Cyberpsychology, Behavior, and Social Networking*, *21*, 523-529. doi:10.1089/cyber.2018.0014.

Davis, R. (2001). A cognitive-behavioral model of pathological Internet use. *Computers in Human Behavior*, *17*, 187-195. doi:10.1016/S0747-5632(00)00041-8.

Durkee, T., Kaess, M., Carli, V., Parzer, P., Wasserman, C., Floderus, B.,… Wasserman, D. (2012). Prevalence of pathological Internet use among adolescents in Europe: Demographic and social factors. *Addiction*, *107*, 2210-2222. doi:10.1111/j.1360-0443.2012.03946.x.

Evans, G. W., Li, D. & Whipple, S. S. (2013). Cumulative risk and child development. *Psychological Bulletin*, *139*, 1342-1396. doi:10.1037/a0031808.

Fam, J. Y. (2018). Prevalence of Internet gaming disorder in adolescents: A meta-analysis across three decades. *Scandinavian Journal of Psychology*, *59*, 524-531. doi:10.1111/sjop.12459.

Fuster, H., Carbonell, X., Pontes, H. M. & Griffiths, M. D. (2016). Spanish validation of the Internet Gaming Disorder-20 (IGD-20) Test. *Computers in Human Behavior*, *56*, 215-224. doi:10.1016/j.chb.2015.11.050.

Gámez-Guadix, M., Orue, I. & Calvete, E. (2013). Evaluation of the cognitive-behavioral model of generalized and problematic Internet use in Spanish adolescents. *Psicothema*, *25*, 299-306. doi:10.7334/psicothema2012.274.

Gentile, D. A., Coyne, S. & Walsh, D. A. (2011). Media violence, physical aggression, and relational aggression in school age children: A short-term longitudinal study. *Aggressive Behavior*, *37*, 193-206. doi:10.1002/ab.20380.

Gómez, P., Rial, A., Braña, T., Golpe, S. & Varela, J. (2017). Screening of problematic Internet use among Spanish adolescents: Prevalence and related variables. *Cyberpsychology, Behavior, and Social Networking*, *20*, 259-267. doi:10.1089/cyber.2016.0262.

González-Cabrera, J., Machimbarrena, J. M., Fernández-González, L., Prieto-Fidalgo, Á., Vergara-Moragues, E. & Calvete, E. (2019). Health-related quality of life and cumulative psychosocial risks in adolescents. *Youth and Society*. doi:10.1177/0044118X19879461.

Greenfield, D. N. (1999). Psychological characteristics of compulsive internet use: A preliminary analysis. *Cyberpsychology and Behavior*, *2*, 403-412.doi:10.1089/cpb.1999.2.403.

Griffiths, M. (2005). A «components» model of addiction within a biopsychosocial framework. *Journal of Substance Use*, *10*, 191-197. doi:10.1080/14659890500114359.

Henson, R. K. (2006). Effect-size measures and meta-analytic thinking in counseling psychology research. *The Counseling Psychologist*, *34*, 601-629. doi:10.1177/0011000005283558.

Kim, E. J., Namkoong, K., Ku, T. & Kim, S. J. (2008). The relationship between online game addiction and aggression, self-control and narcissistic personality traits. *European Psychiatry*, *23*, 212-218. doi:10.1016/j.eurpsy.2007.10.010.

Kojima, R., Sato, M., Akiyama, Y., Shinohara, R., Mizorogi, S., Suzuki, K.,… Yamagata, Z. (2019). Problematic Internet use and its associations with health-related symptoms and lifestyle habits among rural Japanese adolescents. *Psychiatry and Clinical Neurosciences*, *73*, 20-26. doi:10.1111/pcn.12791.

Laconi, S., Tricard, N. & Chabrol, H. (2015). Differences between specific and generalized problematic Internet uses according to gender, age, time spent online and psychopathological symptoms. *Computers in Human Behavior*, *48*, 236-244. doi:10.1016/j.chb.2015.02.006.

Laconi, S., Kaliszewska-Czeremska, K., Gnisci, A., Sergi, I., Barke, A., Jeromin, F.,… Kuss, D. J. (2018). Cross-cultural study of Problematic Internet Use in nine European countries. *Computers in Human Behavior*, *84*, 430-440. doi:10.1016/j.chb.2018.03.020.

Lam, L. T. (2014). Internet gaming addiction, problematic use of the Internet, and sleep problems: A systematic review. *Current Psychiatry Reports*, *16*, 444. doi:10.1007/s11920-014-0444-1.

Lemmens, J. S., Valkenburg, P. M. & Gentile, D. A. (2015). The internet gaming disorder scale. *Psychological Assessment*, *27*, 567-582. doi:10.1037/pas0000062.

León-Mejía, A., González-Cabrera, J., Calvete, E., Patino-Alonso, C. & Machimbarrena, J. M. (2020). Cuestionario de Nomofobia (NMP-Q): Estructura factorial y puntos de corte de la versión española. *Adicciones*, *33,* 137-148. doi:10.20882/adicciones.1316.

López-Fernández, O. (2018). Generalised versus specific Internet use-related addiction problems: A mixed methods study on Internet, gaming, and social networking behaviours. *International Journal of Environmental Research and Public Health*, *15*, 2913. doi:10.3390/ijerph15122913.

Machimbarrena, J. M., Calvete, E., Fernández-González, L., Álvarez-Bardón, A., Álvarez-Fernández, L. & González-Cabrera, J. (2018). Internet risks: An overview of victimization in cyberbullying, cyber dating abuse, sexting, online grooming and problematic Internet use. *International Journal of Environmental Research and Public Health*, *15*, 2471. doi:10.3390/ijerph15112471.

Machimbarrena, J. M., González-Cabrera, J., Ortega-Barón, J., Beranuy-Fargues, M., Álvarez-Bardón, A. & Tejero, B. (2019). Profiles of problematic Internet use and Its impact on adolescents' health-related quality of life. *International journal of environmental research and public health*, *16*. doi:10.3390/ijerph16203877.

Martínez, G., Casado, M.-Á. & Garitaonandia, C. (2020). Online parental mediation strategies in family contexts of Spain. *Comunicar*, *28*, 67-76. doi:10.3916/C65-2020-06.

Munno, D., Cappellin, F., Saroldi, M., Bechon, E., Guglielmucci, F., Passera, R. & Zullo, G. (2017). Internet Addiction Disorder: Personality characteristics and risk of pathological overuse in adolescents. *Psychiatry Research*, *248*, 1-5. doi:10.1016/j.psychres.2016.11.008.

Muñoz-Miralles, R., Ortega-González, R., López-Morón, M. R., Batalla-Martínez, C., Manresa, J. M., Montellà-Jordana, N.,… Torán-Monserrat, P. (2016). The problematic use of Information and Communication Technologies (ICT) in adolescents by the cross sectional JOITIC study. *BMC Pediatrics*, *16*, 1-11. doi:10.1186/s12887-016-0674-y.

Pontes, H. M., Király, O., Demetrovics, Z. & Griffiths, M. D. (2014). The conceptualisation and measurement of DSM-5 internet gaming disorder: The development of the IGD-20 test. *PLoS ONE*, *9*, 1-9. doi:10.1371/journal.pone.0110137.

R Development Core Team 3.0.1. (2013). A language and environment for statistical computing. In *R Foundation for Statistical Computing*. Vienna, Austria: Foundation for Statistical Computing.

Revelle, W. (2015). *Psych: Procedures for Personality and Psychological Research. V 1.5.6.* Retrieved at *https://cran.r-project.org/web/packages/psych/index.html*.

Takahashi, M., Adachi, M., Nishimura, T., Hirota, T., Yasuda, S., Kuribayashi, M. & Nakamura, K. (2018). Prevalence of pathological and maladaptive Internet use and the association with depression and health-related quality of life in Japanese elementary and junior high school-aged children. *Social Psychiatry and Psychiatric Epidemiology*, *53*, 1349-1359. doi:10.1007/s00127-018-1605-z.

The Kidscreen Group Europe. (2006). *The KIDSCREEN Questionnaires—Quality of life questionnaires for children and adolescents. Handbook.* Lengerich: Pabst Science Publishers.

Thomée, S., Härenstam, A. & Hagberg, M. (2011). Mobile phone use and stress, sleep disturbances, and symptoms of depression among young adults—A prospective cohort study. *BMC Public Health*, *11*. doi:10.1186/1471-2458-11-66.

Tokunaga, R. S. (2017). A meta-analysis of the relationships between psychosocial problems and internet habits: Synthesizing internet addiction, problematic internet use, and deficient self-regulation research. *Communication Monographs*, *84*, 423-446. doi:10.1080/03637751.2017.1332419.

Vélez-Galárraga, R., López-Aguilà, S. & Rajmil, L. (2009). Gender and self-perceived health in childhood and adolescence in Spain. *Gaceta Sanitaria*, *23*, 433-439. doi:10.1016/j.gaceta.2009.01.014.

Wallander, J. L. & Koot, H. M. (2016). Quality of life in children: A critical examination of concepts, approaches, issues, and future directions. *Clinical Psychology Review*, *45*, 131-143. doi:10.1016/j.cpr.2015.11.007.

Wartberg, L., Kriston, L. & Kammerl, R. (2017). Associations of social support, friends only known through the Internet, and health-related quality of life with Internet gaming disorder in adolescence. *Cyberpsychology, Behavior, and Social Networking*, *20*, 436-441. doi:10.1089/cyber.2016.0535.

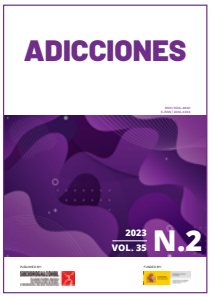
Wartberg, L. & Lindenberg, K. (2020). Predictors of spontaneous remission of problematic Internet use in adolescence: A one-year follow-up study. *International Journal of Environmental Research and Public Health*, *17*, 448. doi:10.3390/ijerph17020448.

Young, K. S. (1996). Psychology of computer use: XL. Addictive use of the Internet—A case that breaks the stereotype. *Psychological Reports*, *79*, 899-902. doi:10.2466/pr0.1996.79.3.899.

Yudes-Gómez, C., Baridon-Chauvie, D. & González-Cabrera, J.-M. (2018). Cyberbullying and problematic Internet use in Colombia, Uruguay and Spain: Cross-cultural study. *Comunicar*, *26*, 2018-7. doi:10.3916/C56-2018-05.

SOCIDROGALCOHOL
Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y las otras Toxicomanías

ADICCIONES
2023 ■ VOL. 35 ■ N. 2 ■ PAGES 119-134
www.adicciones.es



ORIGINAL

Own and others' perceived drinking among freshmen as predictors of alcohol consumption over 10 years

Percepción del consumo de alcohol propio y de allegados en universitarios de primer curso como predictor del consumo a 10 años

Lucía Moure-Rodríguez*, Carina Carbia**, Montserrat Corral Varela***, Ainara Díaz-Geada*, Fernando Cadaveira***, Francisco Caamaño-Isorna*.

* CIBER de Epidemiología y Salud Pública (CIBERESP). Departamento de Medicina Preventiva y Salud Pública. Universidade de Santiago de Compostela. España.

** APC Microbiome Ireland, Biosciences Building, University College Cork, Cork, Irlanda.

*** Departamento de Psicología Clínica y Psicobiología. Universidade de Santiago de Compostela. España.

Abstract

The alcohol use perceptions young people have of those close to them can affect their expectations regarding alcohol and, thus, their own drinking. We aim to identify the predictive ability of own and significant others' perceived drinking at age 18-19 in the alcohol use patterns at 27-28. A cohort study was carried out among university students in Spain (n=1,382). Binge Drinking (BD) and Risky Consumption (RC) were measured with the Alcohol Use Disorders Identification Test at ages 18, 20, 22, 24 and 27. Multilevel logistic regression for repeated measures was used to calculate the adjusted Odds Ratios (ORs). College students perceive their family's alcohol consumption as very low or nothing, while the perception of their own alcohol use or that of their friends is higher. Perceiving higher alcohol use among their siblings and friends increases the risk of BD for both sexes and RC for women. Living away from the parental home increases the risk of RC and BD. In conclusion, the perception of their friend's alcohol use at age 18-19 is the most influential variable in BD among both sexes and in RC among men throughout 10 years of follow-up. Parental alcohol consumption does not affect college student drinking patterns when friends and siblings are considered. Living with one's family acts as a protective factor. Preventive measures focused on young people should take a contextual approach and include those closest to them.

Keywords: heavy episodic drinking, peers, family, emerging adulthood, alcohol drinking in college

Resumen

El consumo percibido por los jóvenes de sus allegados puede afectar a las expectativas respecto al consumo de alcohol y de este modo, a su propio consumo. El objetivo del estudio ha sido identificar la capacidad predictiva de la percepción de consumo de alcohol propio y de los allegados al inicio del periodo universitario, en los patrones de consumo observados a lo largo de 10 años de seguimiento. Se ha llevado a cabo un estudio de cohortes en universitarios en España (n=1.382). Consumo Intensivo de Alcohol (CIA) y Consumo de Riesgo de alcohol (CRA) se midieron con el Test de Identificación de los Trastornos debidos al Uso de Alcohol (AUDIT) a los 18, 20, 22, 24 y 27 años. Se calcularon las Odds Ratios (ORs) con regresión logística multinivel para medidas repetidas. Los universitarios percibían bajo o nulo consumo de alcohol de sus familiares y mayor de sus amigos. Percibir mayor consumo de sus hermanos y amigos aumentó el riesgo de CIA en ambos géneros y de CRA en mujeres. Vivir fuera del domicilio familiar aumentó el riesgo de ambos patrones. En conclusión, la percepción del consumo de alcohol de amigos a los 18-19 años resultó la variable más influyente para el CIA en ambos géneros y el CRA en mujeres a lo largo de 10 años de seguimiento. El consumo de alcohol de los padres al inicio del periodo universitario parece no afectar a los patrones de consumo practicados durante la juventud, una vez se ajusta por el consumo de amigos y hermanos. Vivir en el domicilio familiar actúa como factor protector. Las medidas preventivas en los jóvenes deben tener un enfoque contextual incluyendo a sus allegados.

Palabas clave: consumo intensivo de alcohol, amigos, familia, jóvenes adultos, consumo de alcohol en universitarios

■ *Received: March 2020; Accepted: September 2020.*

■ ISSN: 0214-4840 / E-ISSN: 2604-6334

■ **Send correspondence to:**
Carina Carbia
E-mail: carina.carbiasinde@ucc.ie

Binge drinking (BD) has replaced other more traditional forms of alcohol use among young people in Mediterranean countries (Galán, González & Valencia-Martín, 2014; Martinotti et al., 2017). This pattern has been defined as the intake of large amounts of alcohol in a short period of time, with blood alcohol concentrations reaching at least 0.8 g/ l (Ministerio de Sanidad y Consumo, 2008; National Institute on Alcohol Abuse and Alcoholism, 2004).

There is a general tendency to consider this form of drinking as a characteristic of young people and their period of transition to adulthood, as occurs with other risky behaviours (Bava & Tapert, 2010; Chassin, Pitts & Prost, 2002; Crundall, 1995; Schulenberg, O`Malley, Bachman, Wadsworth & Johnston, 1996). However, the paucity of longitudinal studies in Europe on BD among young people in Mediterranean countries does not allow us to confirm the transitory nature of this consumption pattern. In other contexts, some authors have observed how some of the young people who practise BD during adolescence maintain these patterns during their youth and even in the first years of adulthood (Jefferis, Power & Manor, 2005; Meier, 2010; Patrick et al. al., 2019).

Our research team followed a cohort of young university students, the "Compostela Cohort", in the north-western region of Spain over 10 years. This follow-up made it possible to verify that BD practices at age 27 are not as low as expected (Moure-Rodríguez et al., 2016). These data, together with the negative consequences of these uses in adolescence (Cservenka & Brumback, 2017; Newbury-Birch et al., 2009; World Health Organization, 2018;), show the need to address these behaviours.

University students are a population with high prevalences of BD, both in our cohort and in other studies (Merrill & Carey, 2016; Moure-Rodríguez et al., 2016; Moure-Rodríguez et al., 2018). Among the variables linked to this practice we can highlight age of alcohol initiation, sex, and place of residence (Moure-Rodríguez et al., 2016; Wicki, Kuntsche & Gmel, 2010). Previous studies, mainly in the US, have shown that living away from the family home or living on campus represents a greater risk of these practices, with campus being considered a "wet" environment where alcohol is accessible, and peers may have greater influence (Benz et al., 2020; Simons-Morton et al., 2016). Results of studies with university students in Europe, however, are not so clear – there are differences regarding the university context that can shape these relationships in different ways (Kuntsche et al., 2004).

Young university students' expectations regarding alcohol use at age 18 have been shown to be an explanatory variable of RC and BD in the Compostela 2005 Cohort (Moure-Rodríguez et al., 2016; Moure-Rodríguez et al., 2018). The modifiable nature of this variable justifies the scientific community's interest in it, with research focused on modifying the expectations of young people by increasing negative and decreasing positive expectations aimed at reducing their alcohol use (Monk & Heim, 2013; Scott-Sheldon, Terry, Carey, Garey & Carey, 2012;). However, although some interventions have managed to modify young people's expectations with regard to drinking, this has not led to changes in use beyond the first month after the intervention (Scott-Sheldon et al., 2012).

Expectations can be defined as the set of implicit or explicit beliefs an individual has regarding the consequences of drinking, despite not yet having any personal experience of alcohol (Miller, Smith & Goldman, 1990). According to Critchlow (1986), they are probably generated by observation and cultural norms. As parents represent their closest environment and are their main agents of socialization during childhood, parental alcohol use will have a particular influence on young people's expectations and hence their alcohol use (Bahr, Hoffmann & Yang, 2005; Voogt et al., 2017). Nevertheless, we must not forget that adolescence tends to be a time in which ties and socialisation with peers are strengthened, as autonomy is gained and the time spent with parents decreases. Therefore, at these ages the influence of peers increases (Brown & Larson, 2009; Patrick & Schulenberg, 2013). As Oei and Morawska (2004) explain, when expectations – created as a result of parenting models, the influence of peers and even the media – become establish, they guide young people's behaviour regarding alcohol use, and this use in turn often confirms expectations.

Steinberg (2014) noted that although young people tend to disagree with parents, they normally agree on important issues such as safety and morality. Thus, while both the family context and peers seem to have an effect on young people's drinking (Sellers, McManama, Hernandez & Spirito, 2018; Wood, Read, Mitchell & Brand, 2004), these relationships may vary depending on age or cultural context. The influence of peers on drinking has frequently been addressed, but there is little evidence regarding the role of variables related to the family context in the university population (Windle, Haardörfer, Lloyd, Foster & Berg, 2017).

Taking this into account, our aim was to assess how the perception of first-year university students regarding alcohol use in their close social context – mother, father, siblings and friends – affects their drinking, not only during the first year of university but over nine follow-up years in our sociocultural context and always from a gender perspective.

Method

Design, population and sample

A cohort study with university students (Compostela Cohort 2005, Spain) was carried out between November 2005

and February 2015. Two-stage cluster sampling ensured that at least one first-year class was selected from each of the 33 faculties (a total of 53 classes) at the University of Santiago de Compostela. The number of classes selected in each faculty was proportional to the number of students. All students present in the classroom on the day of the survey were invited to take part in the study (n = 1,382). The questionnaire was completed by 98.6% of the students present. Non-drinkers were excluded from the analysis, although they are included in the descriptive statistics. Subjects were informed both verbally and in writing (in the questionnaire) that participation was voluntary and anonymous and that they could drop out of the study at any time without consequences. The study was approved by the Bioethics Committee of the University of Santiago de Compostela.

Data collection

Two research team members attended each freshman class in November 2005 and invited all students present in the classroom to participate in the study. In November 2007, the same researchers visited the third-year classes for a follow up of the participants; for the 4.5, 6.5 and 9 year follow-ups (2010, 2012 and 2015), they called those students who had provided their telephone number.

On all occasions, participants were assessed through anonymous questionnaires by matching the variables date of birth, sex, department or faculty and class.

The same questionnaires were used on all five occasions. Alcohol consumption was measured using the validated Galician version of the AUDIT (Saunders, Aasland, Babor, de la Fuente & Grant, 1993; Varela, Carrera, Rial, Braña & Osorio, 2006). At the same time, another questionnaire was administered covering factors potentially related to alcohol use (level of maternal education, problems related to alcohol use, age of alcohol initiation, place of residence, expectations regarding drinking and perception of own use that of close friends and relatives). To measure expectations, the participants had to order fourteen expectations regarding alcohol use (e.g., it increases fun, makes it possible to forget problems, causes anxiety, makes you feel depressed), based on the items of a questionnaire previously administered to young people in Spain (Defensor del Menor de la Comunidad de Madrid, 2002). Perceptions were measured on a Likert-type scale with 4 categories (more details on data collection in Moure-Rodríguez et al., 2016).

Definition of variables

Independent variables

The following sociodemographic variables were included: sex, place of residence (parental home / outside the parental home), mother's and father's level of education (primary / secondary / university), age of alcohol initiation (over 16, at 16, at 15, under 15 years of age).

Positive expectations. Based on the number of positive and negative expectations reported, a scale of 0 to 14 was created (0 = highest negative expectations, 14 = highest positive expectations). Scores were classified into tertiles, with the highest tertile corresponding to the subjects with the highest score in positive expectations. This variable was dichotomised by coding the upper tertile as 1 and the middle and lower tertiles as 0.

Perception of alcohol use: Perception of own alcohol use, that of friends, siblings, mother and father at 18 years of age, measured on a Likert scale of 4 categories: none, a little, quite a lot, a great deal.

Dependent variables

1) Risky Consumption (RC): Dichotomous variable generated from the total AUDIT score. Sex-based cut-off points were established at ≥5 for women and ≥6 for men, following the recommendations of the validated Galician version of AUDIT (Varela et al., 2006).
2) Binge Drinking (BD). Dichotomous variable based on the third AUDIT question "How often do you drink 6 or more alcoholic beverages on one occasion?", Coded as 0 = never, 0 = less than once a month, 1 = once a month, 1 = once a week, 1 = daily or almost daily. The sensitivity and specificity of this question with this cut-off point is 0.72 and 0.73 respectively, and the area under the curve is 0.767 (95% CI: 0.718 - 0.816). (Tuunanen, Aalto & Seppä, 2007).

Statistical analysis

Multilevel logistic regression was performed for repeated measures to obtain the Odds Ratios (ORs) adjusted for the independent variables of the final BD and RC models. CIs (95%) were calculated for proportions and medians. As these models are more flexible than traditional ones, they allow us to work with interrelated data, a result of the same subject being assessed on several occasions, which means responses are strongly related in a dependency structure. Faculty and class were considered random effect variables. It was decided not to include missing data, since their distribution allows us to assume that there are no specific distribution patterns. Maximum models were generated including all the theoretical independent variables in accordance with the literature. Final models were constructed from these top models. Non-significant variables were eliminated from the model when their exclusion did not modify the coefficients of the other variables by more than 10% and the Akaike Information Criterion (AIC) value decreased. Data were analysed using generalised linear mixed models with the statistical package SPSS v.20.

Results

The characteristics of the samples of women and men at 18 and 19 years of age are presented in Tables 1 and 2. As can be seen, there are no statistically significant differences for any of the variables in women or men.

Table 3 shows the perceptions of the participants' own drinking and that of those close to them. While only a third of the participants consider that their friends drink a little or no alcohol, this percentage rises to 68.1% when referring to their own drinking and reaches higher levels when referring to relatives, in excess of 90% in the case of parents. In this table, we can see the proportion of subjects with positive expectations based on their perception of alcohol use. A greater proportion of subjects who perceive that their friends, siblings, mother or even they themselves drink a lot have positive expectations regarding alcohol use, although the differences are not statistically significant.

Table 4 and Table 5 show the proportion of subjects who practice RC and BD at 18, 20, 22, 24 and 27 years of age according to the perception of own drinking and that of those close to them at age 18-19, separated by sex. We can observe a trend towards a greater proportion of subjects who practice both drinking patterns as the perception of use by relatives increases.

Figures 1 and 2 show the prevalences of RC at ages 18, 20, 22, 24 and 27 according to the perception of own drinking at 18 among women and men respectively. Figures 3 and 4 make it possible to compare RC trends of young university students aged 18 to 27 based on their friends' perception of use at 18. In all of these, a general downward trend and higher prevalences can be observed in participants with a high perception of their own drinking or that of their friends over the years.

Tables 6 and 7 present the results of RC and BD analyses in women and men respectively, adjusting for the variables included, as well as for maternal education level and age. The variables level of paternal education and level of maternal education did not yield an association with RC or BD.

The perception that friends drink large amounts of alcohol is related to both consumption patterns in women (OR = 17.5 for RC and OR = 19.3 for BD) and with the practice of BD in men (OR = 17.5).

The same association is found among those who perceive higher use in their siblings, with up to three times the risk of RC in women and 11 times greater risk in men (OR = 3.7 and OR = 11.6 respectively) and four times higher risk of BD in women and twice in men (OR = 4.5 and 2.8).

Perception of mothers' drinking does not affect the practice of these drinking patterns in female university students. However, the risk of RC is higher in the bivariate analysis among female university students who consider that their parents drink a little or quite a lot. This association is reversed if they consider that their parents drink a great deal. Among male students, it is the perception that their mothers drink quite a lot of alcohol which increases the risk of practising RC (OR = 8.5); in the bivariate analysis, the perception of their parents' drinking is not associated with these behaviours.

With regard to the place of residence, living outside the family home increases the risk of practising both RC (OR = 1.9 in women and OR = 1.6 in men) and BD (OR = 1.7 in women and OR = 1.6 in men).

Discussion

Young university students tend to perceive that their parents and siblings drink a little or no alcohol, while they consider their own alcohol use or that of their friends to be greater. As the perception of drinking by those close to them increases, the proportion of subjects practising RC and BD also increases. Thus, the risk RC and BD increases for university students of both sexes when they perceive that their siblings drink large amounts of alcohol. This association also exists with respect to the perception of drinking by their friends, but without the risk of RC in men. Regarding the perception of alcohol use by their fathers, this is only associated with an increase in RC among women, while the perception of mothers' drinking is linked to a higher risk of RC among men, as shown in both cases in the bivariate analysis. Finally, living outside the family home increases the risk of both drinking patterns in both men and women.

The high participation rate in this study (98.6% of students present in class on the first visit) permits a very positive assessment of the representativeness of the sample and hence the results obtained. Participation throughout the follow-up fell, from 1,363 subjects at first contact to 875 at the 2-year follow-up, 600 at 4 years, 347 at 6 years, and 415 at 9 years. However, as can be seen in Tables 1 and 2, there were no statistically significant differences in the baseline characteristics of the participants throughout the 9 years of follow-up, so it can be considered that the representativeness of the initial sample was not lost.

More than half of the participants considered that their friends drank quite a lot or a great deal of alcohol, which is in line with the high prevalences of drinking in young people reported in Spain (Ministerio de Sanidad, 2018a; Ministerio de Sanidad, 2018b) as well as in other countries, with one in every three young Europeans practising BD monthly (ESPAD Group, 2016; Farke & Anderson, 2007). In this regard, the prevalence of BD in the Compostela Cohort at 18 years of age is 17.9% and 35.6% for women and men respectively. In addition, university students tend to drink more alcohol and more intensely than their non-university peers (Center for Behavioral Health Statistics and Quality, 2015; Merrill & Carey, 2016; Quinn & Fromme, 2011;). Nevertheless, we must not forget that young people,

Table 1. *Characteristics of women at the beginning of the study in the initial sample and during follow-up.*

	Percentage or mean (95% CI)					
	Initial (18-19 years)	**2-year follow-up (20-21 years)**	**4-year follow-up (22-23 years)**	**6-year follow-up (24-25 years)**	**9-year follow-up (27-28 years)**	**p-value**
	n = 992	**n = 669(67.4%)**	**n = 461(46.5%)**	**n = 266(26.8%)**	**n = 325(32.8%)**	
Maternal education level						
Primary	41.8 (38.4 - 45.3)	44.2 (40.1 - 48.4)	43.1 (38.3 - 48.3)	47.3 (41.3 - 54.1)	45.7 (40.1 - 51.8)	
Secondary	33.6 (30.2 - 37.1)	30.5 (26.4 - 34.7)	30.6 (25.8 - 35.8)	26.5 (20.4 - 33.3)	28.1 (22.5 - 34.2)	
University	24.6 (21.2 - 28.1)	25.3 (21.3 - 29.6)	26.3 (21.4 - 31.4)	26.1 (20.1 - 32.9)	26.2 (20.7 - 32.4)	0.642
Age of alcohol initiation						
Over 16	19.0 (16.5 - 21.8)	17.9 (14.9 - 21.3)	16.5 (13.0 - 20.5)	16.7 (12.1 - 22.5)	14.5 (10.5 - 19.2)	
At 16	38.9 (35.6 - 42.2)	38.1 (34.1 - 42.2)	36.8 (32.0 - 41.7)	40.1(33.6 - 46.8)	36.6 (30.9 - 42.6)	
At 15	25.6 (22.7 - 28.7)	25.9 (22.3 - 29.6)	26.5 (22.2 - 31.1)	26.4 (20.8 - 32.7)	28.3 (23.0 - 34.0)	
Under 15	16.5 (14.0 - 19.7)	18.1 (15.0 - 21.5)	20.3 (16.4 - 24.5)	16.7 (12.1 - 22.5)	20.7 (16.0 - 25.9)	0.438
AUDIT (mean)	5.4 (5.2 - 5.7)	5.6 (5.1 - 5.8)	5.6 (5.2 - 6.0)	5.6 (5.0 - 6.1)	5.3 (4.9 - 5.8)	0.884
Perception of own alcohol consumption at 18-19						
I do not drink	19.1	19.1	18.2	20.3	19.7	
I drink a little	53.7	53.2	54.0	54.9	54.5	
I drink quite a lot	23.1	23.2	23.2	20.7	22.5	
I drink a great deal	3.2	3.4	3.5	3.8	2.8	0.765

Table 2. *Characteristics of men at the beginning of the study in the initial sample and during the follow-up.*

	Percentage or mean (95% CI)					
	Initial (18-19 years)	**2-year follow-up (20-21 years)**	**4-year follow-up (22-23 years)**	**6-year follow-up (24-25 years)**	**9-year follow-up (27-28 years)**	**p-value**
	n = 371	**n = 206(55.5%)**	**n = 139(37.5%)**	**n = 81(21.8%)**	**n = 90(24.2%)**	
Maternal education level						
Primary	32.0 (26.5 - 37.8)	35.8 (28.4 - 43.3)	41.6 (32.8 - 50.8)	43.0 (31.6 - 54.8)	41.6 (31.5 - 53.5)	
Secondary	27.6 (22.1 - 33.3)	27.4 (19.9 - 34.9)	25.5 (16.8 - 34.7)	24.1 (12.7 - 35.8)	27.0 (16.8 - 38.9)	
University	40.3 (34.8 - 46.0)	36.8 (29.3 - 44.3)	32.8 (24.1 - 42.0)	32.9 (21.5 - 44.7)	31.5 (21.3 - 43.4)	0.449
Age of alcohol initiation						
Over 16	18.1 (12.5 - 24.1)	16.8 (9.2 - 24.7)	15.5 (6.9 - 25.5)	16.4 (6.0 - 29.7)	18.2 (7.8 - 30.3)	
At 16	36.9 (31.2 - 42.8)	41.0 (33.5 - 49.0)	44.0 (35.3 - 54.0)	50.7 (40.3 - 64.0)	48.1 (37.7 - 60.1)	
At 15	21.6 (15.9 - 27.5)	20.2 (12.7 - 28.2)	21.6 (12.9 - 1.6)	23.9 (13.4 - 37.2)	20.8 (10.4 - 32.8)	
Under 15	23.4 (17.8 - 29.4)	22.0 (14.4 - 30.0)	19.0 (10.3 - 9.0)	9.0 (0.0 - 22.3)	13.0 (2.6 - 25.1)	0.381
AUDIT (mean)	7.8 (7.2 - 8.4)	7.4 (6.6 - 8.2)	7.3 (6.4 - 8.2)	6.5 (5.4 - 7.6)	7.1 (6.0 - 8.2)	0.784
Perception of own alcohol consumption at 18-19						
I do not drink	16.2	18.9	20.1	19.8	17.8	
I drink a little	39.4	40.3	41.7	45.7	42.2	
I drink quite a lot	33.7	30.6	29.5	27.2	30.0	
I drink a great deal	9.4	9.2	8.6	7.4	10.0	0.830

Table 3. ***Percentage of women and men with positive expectations regarding alcohol based on their perception of their own alcohol consumption, and that of their relatives.***

	Percentage with positive expectations (%)	
	Women n = 992	**Men n = 371**
Perception of own alcohol consumption		
I do not drink (18.3%)	13.7	14.3
I drink a little (49.8%)	25.5	24.8
I drink quite a lot (25.9%)	46.3	42.4
I drink a great deal (5.0%)	50.0*	55.2*
Missing (1.0%)		
Perception of friends' alcohol consumption		
None (1.8%)[a]	11.8	0.0
A little (29.3%)	20.8	25.8
Quite a lot (48.1%)	32.1	34.3
A great deal (19.9%)	36.8*	36.4
Missing (0.8%)		
Perception of consumption siblings' alcohol		
None (44.9%)	27.4	34.2
A little (28.2%)	26.6	31.8
Quite a lot (12.8%)	41.6	25.6
A great deal (2.7%)	44.4*	77.8*
Missing (11.5%)		
Perception of mother's consumption		
None (62.2%)	28.7	33.7
A little (35.5%)	28.7	29.8
Quite a lot (0.7%)	60.0	40.0
A great deal (0.2%)	-	-
Missing (1.3%)		
Perception of father's consumption		
None (32.4%)	28.4	35.4
A little (57.7%)	29.7	32.4
Quite a lot (6.6%)	28.1	23.1
A great deal (1.0%)	14.3	20.0
Missing (2.2%)		

Nota.
[a] Percentages of subjects in the category of men and women combined.
* Significant differences between exposure categories. Test X^2, $p<0.05$.

and specifically university students, tend to overestimate how much their peers and/or friends drink (Cox et al., 2019; Dumas, Davis & Neighbors, 2019), and our data may therefore be partly reflecting this overestimation.

The significant difference between the observed perceptions of their own drinking and that of their friends (Table 3), may also be influenced by a tendency to underestimate their own alcohol use. Gual et al. (2017) found that up to 93.7% of risky drinkers do not see themselves as excessive drinkers. The data presented in Figures 1 and 2 seem to support this underestimation, since 35.9% of the women and 27.2% of the men who declared that they drank no or only a little actually show RC. Furthermore, almost all those who declared that they drank quite a lot or a great deal of alcohol at 18 years of age show RC at the same age (95.0% of women; 96.9% of men); young people who consider that they drink quite a lot or a great deal of alcohol do not, therefore, seem to overestimate their own drinking.

The high percentage of participants who consider that their siblings drink little or no alcohol (73.1%) may be partly due to the fact that they are younger brothers or sisters. The lack of information in this regard prevents further consideration.

Regarding maternal drinking, practically 98% of the participants consider that their mothers do not drink or drink only a little alcohol; hence there is almost no variability in the responses. These data may be a partial reflection of the traditional drinking patterns practised by men (Galán et al., 2014; Wilsnack, Wilsnack & Obot, 2005), although sex differences in many countries are decreasing among the younger generations (ESPAD Group, 2016; Wilsnack et al., 2005).

Perceptions of paternal alcohol use are higher than those of maternal drinking, but lower than those of their own or of friends, and also lower than the prevalence of alcohol use among the Spanish population, around 63% (Ministerio de Sanidad, 2018b).

The low perceptions of parental drinking may be a result of its normalisation since, being the main social agents during childhood (Voogt et al., 2017), it is easy to see parental habits as examples of normality, despite international health recommendations. On the other hand, the way alcohol is used, in addition to being the usual one at home, is surely the traditional one in our social and cultural context – regular consumption accompanying meals. (Galán et al., 2014; Willett et al., 1995) – and probably different to the greater use, both in intensity and quantity, among young people. Although this explanation is not fully supported by the data from the ESTUDES national survey, which shows that adolescents ascribe a similar risk to drinking five or six alcoholic beverages at the weekends and consuming two alcoholic drink every day (Ministerio de Sanidad, 2018a). Both circumstances may involve an underestimation of parental drinking.

The higher proportion of positive expectations regarding alcohol use among those subjects who have higher perceptions of drinking by their parents, siblings, friends and even their own reflects a parallel between these variables, reinforcing the relationship previously

Table 4. ***Percentage of women who practise risky and binge drinking aged between 18 and 27 in relation to their perception of own consumption and that of those close to them at 18-19.***

	Risky Consumption (%)					Binge Drinking (%)				
	Age					Age				
	18	20	22	24	27	18	20	22	24	27
Perception of own alcohol consumption										
I do not drink	1.6	8.6	4.8	1.9	3.1	0.0	1.6	1.2	1.9	0.0
I drink a little	48.0	49.0	42.6	11.0	18.1	9.9	9.6	12.0	5.5	1.7
I drink quite a lot	94.3	88.4	69.2	25.5	35.6	41.9	37.4	29	3.6	11.0
I drink a great deal	100*	100*	81.2*	10.0*	66.7	84.4*	78.3*	56.2	0.0	44.4*
Perception of friends' alcohol consumption										
None	5.0	5.3	8.3	0	11.1	0.0	5.3	0.0	0.0	0.0
A little	28.1	31.7	31.9	8.0	9.3	4.6	8.3	7.2	3.4	0.0
Quite a lot	62.2	60.1	46.8	12.9	23.8	20.3	15.3	18.2	4.5	4.3
A great deal	73.2*	75.2*	58.1*	21.1*	32.7*	40.5*	40.0*	25.7*	5.3	15.4*
Perception of siblings' alcohol consumption										
None	44.5	42.2	37.8	8.7	12.1	13.3	11.6	11.9	2.4	2.1
A little	47.0	51.8	42.5	12.5	23.3	15.7	16.9	17.3	4.7	7.0
Quite a lot	76.2	72.6	58.1	22.2	42.2	30.2	28.4	21.0	8.3	4.4
A great deal	87.0*	82.4*	81.2*	10.0	37.5*	52.2*	41.2*	25.0*	10.0	37.5
Perception of mother's alcohol consumption										
None	51.6	53.1	43.1	11.2	18.0	17.1	15.7	16.2	4.5	3.4
A little	51.6	50.2	42.2	12.0	25.9	19.1	19.3	13.6	3.6	7.1
Quite a lot	80.0	75.0	100	50.0	33.3	0	-	66.7*		-
A great deal	-	-	-	-	-	-	-	-	-	-
Perception of father's alcohol consumption										
None	47.5	48.7	34.7	10.8	14.0	17.2	16.4	14.3	4.8	1.9
A little	53.5	53.0	47.9	13.5	21.9	18.1	16.1	16.9	4.5	5.5
Quite a lot	55.7	65.9	50.0	9.5	38.7*	19.7	27.3	14.7	0.0	9.7
A great deal	12.5*	20.0	0.0*	-	-	12.5	0.0	-	-	-
Total subjects	51.5	52.2	43.2	12.2	20.9^	17.9	16.7	15.7	4.1	4.9^

Nota.
* Significant differences between exposure categories. X^2, p<0.05.
^ Significant differences between ages. Test X^2, p<0.05.

mentioned in the introduction of the manuscript. Thus, the directionality that we ascribe to this relationship leads us to see expectations – which have been influential in RC and BD both in the Compostela 2005 Cohort (Moure-Rodriguez et al., 2018) and in other groups of young people (Anderson, Grunwald, Bekman, Brown & Grant, 2011; Wicki et al., 2010) – as an intermediate variable in the model.

The temporal trend of these drinking patterns in young people generally follows a bell curve, reaching a peak and then beginning to decrease (Andersson, Johnsson, Berglund, & Ojehagen, 2007; Bewick et al., 2008). The results presented in this study show that those who think they and their friends drink a little or nothing reach peak consumption considerably later, at age 22, and even then, their drinking does not reach the RC of their peers. This indicates that a part of this subgroup of young people probably began such drinking patterns during their university period. Starting to drink in these ways at university is a phenomenon that has been observed by other authors (Weitzman, Nelson, & Wechsler, 2003) and indicates the importance of preventive measures during this vital period. It also reinforces the potentially protective effect of how friends use alcohol beyond the first year of university.

Turning to the multivariate analysis, the strongest association was found between the perception of friends' drinking and RC and BD in women and BD in men, which is in line with the literature, where college student drinking, or even BD, can be predicted by the alcohol use of their peers (Borsari, Murphy & Barnett, 2007; Dumas, Davis, Maxwell-Smith & Bell, 2018; Robinson, Jones, Christiansen & Field, 2015). In this study we asked participants about the alcohol use of their friends, thus assessing the specific effect

Table 5. ***Percentages of men who practise risky and binge drinking aged between 18 and 27 in relation to their perception of own consumption and that of those close to them at 18-19.***

	Risky Consumption (%)					Binge Drinking (%)				
	Age					Age				
	18	20	22	24	27	18	20	22	24	27
Perception of own alcohol consumption										
I do not consume	3.3	15.4	14.3	6.2	0	1.7	5.1	21.4	0.0	.0
Little consumption	37.7	56.6	53.4	13.5	39.3	12.3	24.1	34.5	8.1	7.9
Considerable consumption	96.0	90.5	78.0	36.4	46.4	66.4	68.3	58.5	27.3	40.7
I consume a lot	100*	100*	83.3*	66.7*	14.3*	85.7*	78.9*	83.3*	83.3*	44.4*
Perception of friends' alcohol consumption										
None	20.0	-	-	-		0.0	0.0	-	-	-
A little	23.3	31.0	35.5	22.2	6.2	9.5	19.7	2.8	16.7	6.2
Quite a lot	58.8	68.4	58.1	20.5	37.2	32.4	37.0	41.9	15.4	23.3
A great deal	80.7*	77.4*	67.4*	26.1	37.9*	58.8*	58.1*	58.1*	21.7	24.1
Perception of alcohol consumption by siblings										
None	54.6	58.7	54.9	29.3	31.9	32.4	33.7	42.3	24.4	21.3
A little	57.8	59.1	54.8	18.2	15.5	41.0	36.4	45.3	13.6	20.0
Quite a lot	64.6	66.7	56.2	12.5	33.3	39.6	54.2	37.5	12.5	22.2
A great deal	100*	100*	80.0	-	-	71.4*	70.0*	80.0	-	25.0
Perception of mother's alcohol consumption										
None	56.9	63.7	52.5	22.2	30.8	33.8	45.2	41.2	14.0	19.2
A little	57.1	58.8	56.4	25.0	28.6	37.0	34.1	41.8	25.0	20.0
Quite a lot	100	-	-	-		80.0	33.3	-	-	-
A great deal						-	-	-	-	-
Perception of father's alcohol consumption										
None	54.8	65.5	56.8	34.8	33.3	32.7	44.2	43.2	26.1	29.2
A little	56.5	60.6	52.4	17.0	26.0	35.9	39.4	42.7	12.8	14.0
Quite a lot	80.0	68.4	64.3	33.3	50.0	43.3	26.3	35.7	33.3	40.0
A great deal	66.7	66.7	-	-	-	66.7	33.3	-	-	-
Total subjects	58.0	62.6	55.4	22.2	31.1^	35.6	38.8	43.2	17.3	20.0^

Nota.
* Significant differences between categories of consumption perception. X^2 , $p<0.05$.
^ Significant differences between ages. Test X^2, $p<0.05$.

of the behaviour of their closest circle. It is logical to think that friends have a stronger effect on university students than their peers in general since they are the people with whom they spend the most time. This is consistent with the scientific literature, which has found that close friends or reference groups most similar to oneself have shown a greater influence on the alcohol use of young people (Larimer et al., 2009; Mallett, Bachrach & Turrisi, 2009). Thus, Larimer et al. (2009) conclude that carrying out feedback regarding the alcohol use of the reference groups with greater affinity would be more effective. Mallet et al. (2009) studied the perception of drinking by university students with respect to reference groups, students of the same sex and friends, the latter group being the only one to influence the alcohol use of young participants. In these results, we can observe how the influence of a perception of higher alcohol use by friends at 18 years of age increases the risk of practising both drinking patterns over a 9-year follow-up, beyond the university period. This can also be seen in Figures 3 and 4, which show a clear difference in the prevalences of RC as a function of the perception of consumption by friends. Even despite the increase in prevalences of RC up to the age of 22 among those who considered their friends to be drinking a little or nothing at age 18, the prevalences remained below those of their peers throughout the follow-up period, and only matched them during the most important drop in RC, at age 24.

These results highlight the importance of acting on the perception of friends' drinking in alcohol prevention programs during adolescence and youth, not only to

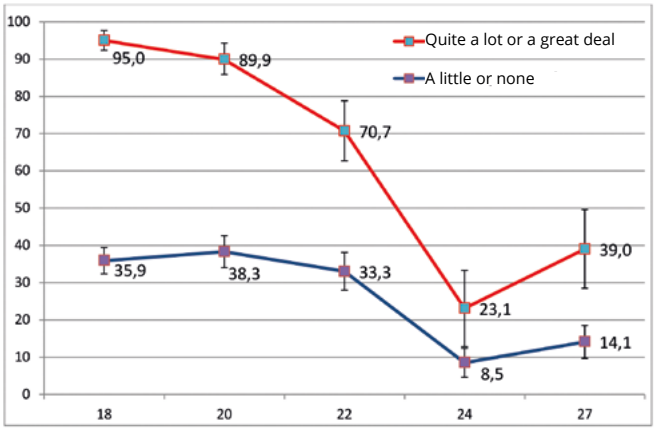


Figure 1. **Prevalence (%) of risky alcohol consumption among women at ages 18, 20, 22, 24 and 27 according to the perception of their own consumption at age 18.**

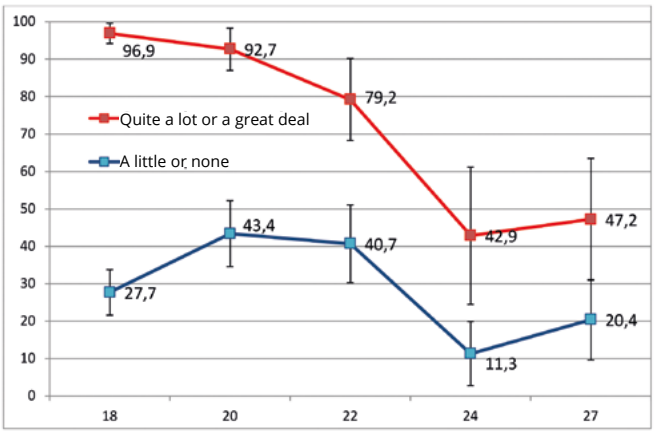


Figure 2. **Prevalence (%) of risky alcohol consumption among men at ages 18, 20, 22, 24 and 27 according to the perception of their own consumption at age 18.**

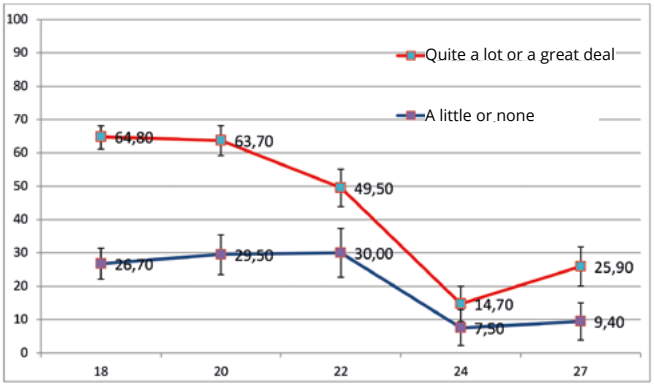


Figure 3. **Prevalence (%) of risky alcohol consumption among women at ages 18, 20, 22, 24 and 27 according to their friends' perception of consumption at age 18.**

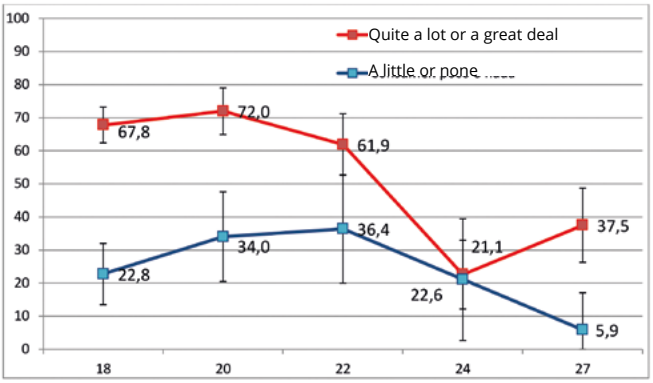


Figure 4. **Prevalence (%) of risky alcohol consumption among men at ages 18, 20, 22, 24 and 27 according to their friends' perception of consumption at age 18.**

prevent risky drinking in the first year of university, but also during subsequent years. In this sense, advertising directly targeting young people (with pictures of people their age drinking alcohol) is especially damaging. The regulation of advertising aimed at young people is an essential step to avoid the normalisation of alcohol use at these ages (Sargent & Babor, 2020).

Although the literature is not homogeneous in this regard, some authors have found evidence suggesting that women tend to be more influenced by the drinking of their friends. Along these lines, Simons-Morton et al. (1999) report that having problem friends increases the risk of drinking only in adolescent women, while Gaughan (2006) finds influences of drinking by friends of the opposite sex only among women. This may partly explain why this variable has no effect in the multivariate analysis for RC in men.

It could be argued that a possible limitation of the study is the lack of information regarding the real alcohol use of closest friends and relatives since this information is taken directly from the participants, but previous studies focusing on adolescents and young people have found that their perceptions of drinking by their peers are a better predictor of their alcohol use than the actual consumption of their peers (Deutsch, Chernyavskiy, Steinley & Slutske, 2015; Kenney, Ott, Meisel & Barnett, 2017). In addition, the high prevalence of RC and BD found in the cohort at 18 and 19 years (58.0% and 35.6% in men and 51.5% and 17.9% in women respectively) supports the accuracy of participants' reported perception of their friends' drinking.

Our results show that the perception that siblings drink a great deal of alcohol increases the risk of RC and BD in both sexes. Although the evidence in the literature in this regard is scarce, the results obtained are in line with previous studies showing the alcohol use of older siblings to be an important predictor of drinking among the young (Stormshak, Comeau & Shepard, 2004; Whiteman, Jensen & Maggs, 2013). Siblings are part of the family context during a vital period in which the influence of parents appears to decrease as young people interact with each other and become more influenced by their peers (Aseltine, 1995; Voogt et al., 2017). The relationships between siblings are

Table 6. ***Influence of own consumption and the consumption of those close to them at 18 years of age on risky consumption and binge drinking of female university students aged 18 to 27.***

	Odds ratio (95%CI)			
	Risky Consumption		Binge Drinking	
	Bivariate	Multivariate[a]	Bivariate	Multivariate[a]
Perception of friends' alcohol consumption				
None	1	1	1	1
A little	5.7 (2.0 - 16.3)	3.8 (1.3 - 11.4)	3.7 (0.4 - 31.1)	2.2 (0.3 - 17.7)
Quite a lot	18.1 (6.4 - 51.4)	11.2 (3.8 -32.7)	13.0 (1.6 - 107.4)	6.9 (0.9 -55.7)
A great deal	30.4 (10.6 - 87.4)	17.5 (5.8 - 52.2)	34.6 (4.2 - 288.2)	19.3 (2.4 - 156.6)
Perception of siblings' alcohol consumption				
None	1	1	1	1
A little	1.2 (1.0 - 1.5)	1.3 (1.3 - 1.6)	1.4 (1.0 - 1.8)	1.1 (0.9 - 1.4)
Quite a lot	3.4 (2.6 - 4.5)	2.9 (2.2-3.8)	2.6 (1.9 - 3.6)	2.7 (2.0 - 3.6)
A great deal	5.0 (2.9 - 8.8)	3.7 (2.0 - 7.0)	5.7 (3.3 - 9.7)	4.5 (2.4 - 8.4)
Perception of mother's alcohol consumption				
None	1		1	
A little	1.0 (0.8 - 1.1)		1.1 (0.9 - 1.4)	
Quite a lot	2.5 (0.9 - 6.8)		0.7 (0.2 - 3.2)	
Perception of father's alcohol consumption				
None	1		1	
A little	1.4 (1.1 - 1.6)		1.1 (0.9 - 1.4)	
Quite a lot	1.9 (1.3 - 2.6)		1.4 (0.9 - 2.2)	
A great deal	0.1 (0.03 - 0.6)		0.3 (0.04 - 2.4)	
Place of residence				
Family home	1	1	1	1
Outside the family home	1.6 (1.3 - 2.0)	1.9 (1.5 - 2.4)	1.6 (1.2 - 2.1)	1.7 (1.2 - 2.3)

Nota. [a] Adjusted for the other variables included in the column and level of maternal education and age of the participants (period).

probably more similar to those with peers (Schuler, Tucker, Pedersen & D'Amico, 2019; Serafini & Stewart, 2015); being closer in age, it is possible that they feel more in tune with each other, share more interests and similar important moments. Older siblings can be seen as role models, and their alcohol use, therefore, influences the younger ones. In a study in this regard, Whiteman et al. (2016), after taking into account shared friends between siblings, supported the hypothesis put forward by numerous authors researching the school population regarding the influence of older siblings on the drinking of minors, probably facilitating access to alcohol and even the places to drink it.

No link was found between the perception of parental drinking and BD or RC patterns. This lack of association may partly be due to the low variability of these variables. Our results show that the perception that fathers drink a little or quite a lot of alcohol increases the risk of women's RC, and the perception that mothers consume quite a lot of alcohol increases the risk of men's RC, in both cases in the bivariate analysis. Similarly, an association was found in the bivariate analysis of drinking by fathers and mothers and the alcohol use of university students in 3,418 students at seven universities in the state of Georgia (Windle, Haardörfer, Lloyd, Foster & Berg, 2017).

However, the fact that the father drinks a great deal of alcohol acts as a protective factor in women. One possible explanation is that seeing the father drink regularly normalises drinking, but only up to a certain point where the negative effects of this drinking become more evident. This phenomenon has previously been described in the literature and is known as "aversive transmission", consisting precisely in that the more the parents drink, the more their children do the same, but once these amounts reach very high levels, they drop considerably among children, particularly daughters (Harburg, DiFranceisto, Webster, Gleiberman & Schork, 1990). This association disappears when other variables come into play, such as the alcohol use of friends. Windle et al. (2017) explain this as a reflection of reduced parental influence as their children grow up, which is inversely parallel to the stronger effect on young people's substance use of the attitudes and substance use of the individuals and groups with whom they interact

Table 7. ***Influence of own consumption and the consumption of those close to them at 18 years of age on risky consumption and binge drinking of male university students aged 18 to 27.***

	Odds ratio (IC 95%)			
	Risk consumption of alcohol		Intensive Alcohol Consumption	
	Bivariate	Multivariate[a]	Bivariate	Multivariate[a]
Perception of friends' alcohol consumption				
None	1		1	1
A little	0.6 (0.2 - 1.9)	¿???	2.8 (0.3 - 25.9)	2.7 (0.3 - 27.4)
Quite a lot	2.1 (0.6 - 6.8)		7.2 (0.8 - 63.2)	7.0 (0.7-67.3)
A great deal	4.1 (1.3 - 13.4)		17.9 (2.0 - 158.8)	17.5 (1.8 - 170.3)
Perception of siblings' alcohol consumption				
None	1	1	1	1
A little	0.9 (0.6 - 1.3)	0.8 (0.6 - 1.2)	1.1 (0.8 - 1.6)	1.1 (0.7 - 1.6)
Quite a lot	1.3 (0.8 - 2.1)	1.2 (0.7 - 1.9)	1.3 (0.8 - 2.1)	1.2 (0.7 - 2.0)
A great deal	11.7 (3.3 - 41.9)	11.6 (3.3 - 40.9)	4.2 (2.0 - 9.1)	2.8 (1.2 - 6.6)
Perception of mother's alcohol consumption				
Does not consume	1		1	
Little consumption	1.0 (0.7 - 1.3)		1.3 (0.7 - 1.4)	
Considerable consumption	8.5 (1.6 - 46.6)		1.8 (0.7 - 5.1)	
Perception of father's alcohol consumption				
None	1		1	
A little	0.9 (0.6 - 1.2)		0.8 (0.6 - 1.2)	
Quite a lot	1.7 (1.0 - 3.1)		0.9 (0.5 - 1.6)	
A great deal	0.8 (0.3 - 2.4)		0.8 (0.3 - 2.4)	
Place of residence				
Family home	1	1	1	1
Outside the family home	1.6 (1.2 - 2.2)	1.6 (1.1 - 2.3)	1.6 (1.1 - 2.2)	1.6 (1.1 - 2.4)

Nota. [a]Adjusted for the other variables included in the column and level of maternal education and age of the participants (period).

more frequently and in a more intense way (Bahr et al., 2005).

It is of particular interest that the associations between the perception of parental drinking and RC is found in the bivariate analysis, while the perceptions of friends' drinking are associated with BD in both sexes, a more common pattern among young people (Ministerio de Sanidad, 2018b).

The risk of RC and BD in university students increases when living outside the family home, a variable clearly related to the family context and one which maintains its effect in the multivariate analysis. This means that university students living in the family home with the same perception of drinking by friends, father, mother or siblings as those living outside have a lower risk of RC and BD. This variable has previously been shown to influence these drinking pattern in the Compostela 2005 Cohort (Moure-Rodríguez et al., 2016), and we believe it reflects the greater supervision or parental monitoring of young people living in the family home. This has also been observed by other authors, and can be seen as a protective factor against alcohol use in young people (Moore, Rothwell & Segrott, 2010). Some authors have reported that greater parental monitoring in the sense of knowing who their sons and daughters mix with or what they do – or simply the greater sense of participation that students feel – acts as a protective factor against drinking, even during the university period (Abar & Turrisi, 2008; Jessor, Costa, Krueger & Turbin, 2006; Wood et al., 2004). Therefore, living with parents during college can reduce the influence of peers regarding alcohol use (White, Fleming, Kim, Catalano & McMorris, 2008). Quinn et al. (2011) carried out a study which compared university students with non-university students, concluding that social group norms affect non-university students less, probably because the former tend to live with their peers and are therefore more influenced by them. Young people who live in the family home will not experience such a closed and ongoing relationship with their peers. In addition, peer pressure on campus will increase the likelihood of BD – peers act as providers of alcohol, older students can act as role models – so the environment thus helps to make the practice of BD normal and accepted (Borsari & Carey, 2001).

In view of these results, preventive measures should be designed in the future from a contextual perspective, where not only young university students but also their closest circle – friends, siblings – are taken into account. Along these lines, in a review of the scientific literature Lewis and Neighbors (2006) conclude that personalised feedback on peer drinking has been effective in reducing alcohol use and its negative consequences among young people. Our study confirms the importance of the influence of social relationships on these practices among our university students. In addition, living in the family home at the beginning of the university period continues to act as a protective factor, and not only during the first years of university, but during the following 10 years, hence highlighting the influence of the family context, which continues to protect from these risk behaviours even in a society where drinking is highly normalised (Ministerio de Sanidad, Política Social e Igualdad, s.f.).

This study has four main limitations: 1) As in other cohort studies, subjects dropping out during follow up can lead to biases. However, there were no significant differences among participants throughout the study period, suggesting the absence of any such bias; 2) Information bias is always likely in self-report questionnaires. To minimize this bias, the AUDIT, an internationally validated questionnaire among adolescents and young adults, was used; 3) The third question in AUDIT does not differentiate between sexes, which may mean that the prevalence of BD in women is underestimated in this study as it does not take into account women who drink five alcoholic beverages on a single occasion. Nevertheless, this only affects the descriptive analysis and not the analytical results; and 4) the questionnaire on expectations has not been validated and it is thus possible that the expectations regarding alcohol use have not been measured correctly.

Conclusion

University students perceive that their friends drink much more, and that they themselves drink much more than their relatives. As the perception of alcohol use by those close to them increases, so does the proportion of subjects who practise RC and BD. The risk of practising RC and BD increases in both sexes when university students perceive that their siblings consume large amounts of alcohol. This association is also true regarding the drinking of their friends, except for RC in men, where it is absent. Alcohol use patterns of parents do not affect college student drinking when friends and siblings are taken into account. Finally, living outside the family home increases the risk of both drinking patterns among college and university students. In view of these results, the design of future preventive measures should take into account not only the targeted young people but also the context and those close to them.

Acknowledgments

This work has been funded by the National Plan on Drugs (Spain) (2005 / PN014) and the Sanitary Research Fund (Spain) (PI15 / 00165). Carina Carbia has been funded by the European Union's Horizon 2020 research and innovation program with the Marie Sklodowska-Curie grant No. 754535.

Conflict of interests

The authors declare no conflict of interest.

References

Abar, C. C. & Turrisi, R. (2008). How important are parents during the college years? A longitudinal perspective of indirect influences parents yield on their college teens' alcohol use. *Addictive Behaviors, 33*,1360-1368. doi:10.1016/j.addbeh.2008.06.010.

Anderson, K. G., Grunwald, I., Bekman, N., Brown, S.A. & Grant, A. (2011). To drink or not to drink: motives and expectancies for use and nonuse in adolescence. *Addictive Behaviors, 36*, 972-979. doi:10.1016/j.addbeh.2011.05.009.

Andersson, C., Johnsson, K.O., Berglund, M. & Ojehagen, A. (2007). Alcohol involvement in Swedish university fresh men related to gender, age, serious relations hip and family history of alcohol problems. *Alcohol and Alcoholism, 42*, 448-455. doi:10.1093/alcalc/agm008.

Aseltine, R. H. (1995). A reconsideration of parental and peer influences on adolescent deviance. *Journal of Health and Social Behavior, 36*, 103-121.

Bahr, S. J., Hoffmann, J. & Yang, X. (2005). Parental and peer influences on the risk of adolescent drug use. *The Journal of Primary Prevention, 26*, 529-551. doi:10.1007/s10935-005-0014-8.

Bava, S. & Tapert, S. F. (2010). Adolescent brain development and the risk for alcohol and other drug problems. *Neuropsychology review, 20*, 398-413. doi:10.1007/s11065-010-9146-

Benz, M. B., DiBello, A. M., Balestrieri, S. G., Miller, M. B., Merrill, J.E., Lowery, A.D., …Carey, K. B. (2017). Off-campus residence as a risk factor for heavy drinking among college students. *Substance Use and Misuse, 52*, 1133-1138. doi:10.1080/10826084.2017.1298620.

Bewick, B. M., Mulhern, B., Barkham, M., Trusler, K., Hill, A. J. & Stiles, W. B. (2008). Changes in undergraduate student alcohol consumption as they progress through university. *BMC Public Health, 8*,163. doi:10.1186/1471-2458-8-163.

Borsari, B. & Carey, K. B. (2001). Peer influences on college drinking: A review of the research. *Journal of Substance Abuse, 13*, 391-424.

Borsari, B., Murphy, J. G. & Barnett, N. P. (2007). Predictors of alcohol use during the first year of college: Implications for prevention. *Addictive Behaviors, 32*, 2062-2086. doi:10.1016/j.addbeh.2007.01.017.

Brown, B. B. & Larson, J. (2009). Peer relationships in adolescence. En R.M. Lerner & L. Steinberg (Eds.), Handbook of Adolescent Psychology (pp. 74-103). New York: Wiley & Sons.

Center for Behavioral Health Statistics and Quality. (2015). 2014 National Survey on Drug Use and Health Detailed Tables (NSDUH). Rockville, MD: Substance Abuse and Mental Health Services Administration (SAMHSA).

Chassin, L., Pitts, S. C. & Prost, J. (2002). Binge drinking trajectories from adolescence to emerging adulthood in a high-risk sample: predictors and substance abuse outcomes. *Journal of Consulting and Clinical Psychology, 70*, 67-78.

Cox, M. J., DiBello, A. M., Meisel, M. K., Ott, M. Q., Kenney, S. R., Clark, M. A. & Barnett, N. P. (2019). Do misperceptions of peer drinking influence personal drinking behavior? Results from a complete social network of first-year college students. *Psychology of Addictive Behaviors, 33*, 297-303. doi:10.1037/adb0000455.

Critchlow, B. (1986). The powers of John Barleycorn: beliefs about the effects of alcohol on social behavior. *The American Psychologist, 41*, 751-764.

Crundall, I. A. (1995). Perceptions of alcohol by student drinkers at university. *Drug and Alcohol Review, 14*, 363-368.

Cservenka, A. & Brumback, T. (2017). The burden of binge and heavy drinking on the brain: effects on adolescent and young adult neural structure and function. *Frontiers in Psychology, 8*,1111. doi:10.3389/fpsyg.

Defensor del Menor de la Comunidad de Madrid. (2003). Análisis del consumo de alcohol por los jóvenes en la Comunidad de Madrid. En El Defensor del Menor de la Comunidad de Madrid (Eds.), Defensor del Menor de la Comunidad de Madrid: Estudios e investigaciones 2002 (pp. 307-390). Madrid: Defensor del Menor en la Comunidad de Madrid.

Deutsch, A. R., Chernyavskiy, P., Steinley, D. & Slutske, W. S. (2015). Measuring peer socialization for adolescent substance use: A comparison of perceived and actual friends' substance use effects. *Journal of Studies on Alcohol and Drugs, 76*, 267-277. doi:10.15288/jsad.2015.76.267.

Dumas, T. M., Davis, J. P., Maxwell-Smith, M. A. & Bell, A. (2018). From drinking group norms to individual drinking consequences: A moderated mediation model examining the role of members' status, identification with the group and with emerging adulthood. *Substance Use and Misuse, 53*, 1311-1323. doi:10.1080/10826084.2017.1408651.

Dumas, T. M., Davis, J. P. & Neighbors, C. (2019). How much does your peer group really drink? Examining the relative impact of overestimation, actual group drinking and perceived campus norms on university students' heavy alcohol use. *Addictive Behaviors, 90*, 409-414. doi:10.1016/j.addbeh.2018.11.041.

ESPAD Group. (2016). ESPAD Report 2015: Results from the European School Survey Project on Alcohol and Other Drugs. Luxembourg: Publications Office of the European Union.

Farke, W. & Anderson, P. (2007). Binge drinking in Europe. *Adicciones, 19*, 333-339.

Galán, I., González, M. J. & Valencia-Martín, J. L. (2014). Patrones de consumo de alcohol en España: un país en transición. *Revista Española de Salud Publica, 88*, 529-540. doi: 10.4321/S1135-57272014000400007.

Gaughan, M. (2006). The gender structure of adolescent peer influence on drinking. *Journal of Health and Social Behavior, 47*, 47-61. doi:10.1177/002214650604700104.

Gual, A., Ángel Arbesú, J., Zarco, J., Balcells-Oliveró, M.L.M., López-Pelayo, H., Miquel, L. & Bobes, J. (2017). Risky drinkers underestimate their own alcohol consumption. *Alcohol and Alcoholism, 52*, 516-517. doi:10.1093/alcalc/agx029.

Harburg, E., DiFranceisto, W., Webster, D.W., Gleiberman, L. & Schork, A. (1990). Familial transmission of alcohol use: II. Imitation of and aversion to parent drinking (1960) by adult offspring (1977)-Tecumseh, Michigan. *Journal of Studies on Alcohol, 51*, 245-256. doi:10.15288/jsa.1990.51.245.

Jefferis, B. J., Power, C. & Manor, O. (2005). Adolescent drinking level and adult binge drinking in a national birth cohort. *Addiction, 100*, 543-549. doi:10.1111/j.1360-0443.2005.01034.x.

Jessor, R., Costa, F. M., Krueger, P. M. & Turbin, M. S. (2006). A developmental study of heavy episodic drinking among college students: the role of psychosocial and behavioral protective and risk factors. *Journal of Studies on Alcohol, 67*, 86-94.

Kenney, S. R., Ott, M., Meisel, M. K. & Barnett, N. P. (2017). Alcohol perceptions and behavior in a residential peer social network. *Addictive Behaviors, 64*, 143-147. doi:10.1016/j.addbeh.2016.08.047.

Kuntsche, E., Rehm, J & Gmel, G. (2004). Characteristics of binge drinkers in Europe. S*ocial Science & Medicine, 59*, 113-127. doi:10.1016/j.socscimed.2003.10.009

Larimer, M. E., Kaysen, D. L., Lee, C. M., Kilmer, J. R., Lewis, M. A., Dillworth, T., ... Neighbors, C. (2009). Evaluating level of specificity of normative referents in relation to personal drinking behavior. *Journal of Studies on Alcohol and Drugs, 16*, 115-121. doi:10.15288/jsads.2009.s16.115.

Lewis, M. A. & Neighbors, C. (2006). Social norms approaches using descriptive drinking norms education: A review of the research on personalized normative feedback. *Journal of American College Health, 54*, 213-218.

Mallett, K. A., Bachrach, R. L. & Turrisi, R. (2009). Examining the unique influence of interpersonal and intrapersonal drinking perceptions on alcohol consumption among college students. *Journal of Studies on Alcohol and Drugs, 70*, 178-185. doi:10.15288/jsad.2009.70.178.

Martinotti, G., Lupi, M., Carlucci, L., Santacroce, R., Cinosi, E., Acciavatti, T., ... Di Giannantonio, M. (2017). Alcohol drinking patterns in young people: A survey-based study. *Journal of Health Psychology, 22*, 1889-1896. doi:10.1177/1359105316667795.

Meier, P. S. (2010). Polarized Drinking Patterns and Alcohol Deregulation: Trends in alcohol consumption, harms and policy: United Kingdom 1990-2010. *Nordic Studies on Alcohol and Drugs, 27*, 383-408. doi:10.1177/145507251002700501.

Merrill, J. E. & Carey, K. B. (2016). Drinking over the lifespan: Focus on college ages. *Alcohol Research, 38*, 103-114.

Miller, P. M., Smith, G. T. & Goldman, M.S. (1990). Emergence of alcohol expectancies in childhood: a possible critical period. *Journal of Studies on Alcohol, 51*, 343-349.

Ministerio de Sanidad, Política Social e Igualdad. Delegación del Gobierno para el Plan Nacional sobre Drogas. (2018a). Informe 2018. Alcohol, tabaco y drogas ilegales en España. Encuesta sobre Uso de Drogas en Enseñanzas Secundarias en España (ESTUDES) 1994-2016. Madrid: Ministerio de Sanidad, Política Social e Igualdad.

Ministerio de Sanidad, Política Social e Igualdad. Delegación del Gobierno para el Plan Nacional sobre Drogas. (2018b). Encuesta Sobre Alcohol y otras drogas en España (EDADES) 1995-2017. Madrid: Ministerio de Sanidad, Política Social e Igualdad.

Ministerio de Sanidad, Política Social e Igualdad. (s.f.). Situación actual del consumo de alcohol en España. Ministerio de Sanidad, Política Social e Igualdad. Retrieved at http://www.mscbs.gob.es/campannas/campanas10/embarazadasCeroAlcohol/situacion_actual_del_consumo_de_alcohol.html.

Ministerio de Sanidad y Consumo. (2008). Prevención de los problemas derivados del alcohol. 1ª Conferencia de prevención y promoción de la salud en la práctica clínica en España. Madrid 14 y 15 de junio de 2007. Madrid: Ministerio de Sanidad y Consumo. Retrieved at https://www.mscbs.gob.es/profesionales/saludPublica/prevPromocion/alcohol/docs/prevencionProblemasAlcohol.pdf.

Monk, R. L. & Heim, D. (2013). A critical systematic review of alcohol-related outcome expectancies. *Substance Use and Misuse, 48*, 539-557. doi:10.3109/10826084.2013.787097.

Moore, G.F., Rothwell, H. & Segrott, J. (2010). An exploratory study of the relationship between parental attitudes and behavior and young people's consumption of alcohol. *Substance Abuse Treatment, Prevention, and Policy, 22*, 5-6. doi:10.1186/1747-597X-5-6.

Moure-Rodriguez, L., Carbia, C., Lopez-Caneda, E., Corral, M., Cadaveira, F. & Caamaño-Isorna, F. (2018). Trends in alcohol use among young people according to the pattern of consumption on starting university: A 9-year follow-up study. *PLoS One, 13*, e0193741. doi:10.1371/journal.pone.0193741.

Moure-Rodríguez, L., Piñeiro, M., Corral, M., Rodríguez-Holguín, S., Cadaveira, F. & Caamaño-Isorna, F. (2016). Identifying predictors and prevalence of alcohol consumption among university students: Nine years of follow-up. *PLoS One, 11*, e0165514. doi:10.1371/journal. pone.0165514.

National Institute on Alcohol Abuse and Alcoholism. (2004). NIAAA council approves definition of binge drinking. NIAAA Newsletter,3,3. Retrieved at http://pubs.niaaa.nih.gov/publications/Newsletter/winter2004/Newsletter_Number3.pdf.

Newbury-Birch, D., Walker, J., Avery, L., Beyer, F., Brown, N., Jackson, K., ... Stewart, S. (2009). Impact of Alcohol Consumption on Young People: A systematic review of published reviews. Newcastle: Institute of Health and Society at Newcastle university: Department for Children, Schools and Families.

Oei, T. P. & Morawska, A. (2004). A cognitive model of binge drinking: the influence of alcohol expectancies and drinking refusal self-efficacy. *Addictive Behaviors, 29*, 159-179.

Patrick, M. E. & Schulenberg, J. E. (2013). Prevalence and predictors of adolescent alcohol use and binge drinking in the United States. *Alcohol Research: Current Reviews, 35*, 193-200.

Patrick, M. E., Terry-McElrath, Y. M., Lanza, S. T., Jager, J., Schulenberg, J. E. & O'Malley, P. M. (2019). Shifting age of peak binge drinking prevalence: historical changes in normative trajectories among young adults aged 18 to 30. *Alcoholism, Clinical and Experimental Research, 43*, 287-298. doi:10.1111/acer.13933.

Quinn, P. D. & Fromme, K. (2011). Alcohol use and related problems among college students and their noncollege peers: the competing roles of personality and peer influence. *Journal of Studies on Alcohol and Drugs, 72*, 622-632. doi:10.15288/jsad.2011.72.622.

Robinson, E., Jones, A., Christiansen, P. & Field, M. (2015). Drinking like everyone else: trait self-control moderates the association between peer and personal heavy episodic drinking. *Substance Use and Misuse, 50*, 590-597. doi:10.3109/10826084.2014.991407.

Sargent, J.D.& Babor, T.F. (2020). The relationship between exposure to alcohol marketing and underage drinking is causal. *Journal of Studies on Alcohol and Drugs, 19*, 113-124.

Saunders, J. B., Aasland, O. G., Babor, T. F., De la Fuente, J. R. & Grant, M. (1993). Development of the alcohol use disorders identification test (AUDIT): WHO collaborative project on early detection of persons with

harmful alcohol consumption--II. *Addiction, 88*, 791-804. doi:10.1111/j.1360-0443.1993.tb02093.x.

Schulenberg, J., O`Malley, P. M., Bachman, J. G., Wadsworth, K. N. & Johnston, L. D. (1996). Getting drunk and growing up: trajectories of frequent binge drinking during the transition to young adulthood. *Journal of Studies on Alcohol, 57*, 289-304.

Schuler, M. S., Tucker, J. S., Pedersen, E. R. & D'Amico, E. J. (2019). Relative influence of perceived peer and family substance use on adolescent alcohol, cigarette, and marijuana use across middle and high school. *Addictive Behaviors, 88*, 99-105. doi:10.1016/j.addbeh.2018.08.025.

Scott-Sheldon, L. A., Terry, D. L., Carey, K. B., Garey, L. & Carey, M. P. (2012). Efficacy of expectancy challenge interventions to reduce college student drinking: a meta-analytic review. *Psychology of Addictive Behaviors, 26*, 393-405.

Sellers, C. M., McManama O'Brien, K. H., Hernandez, L. & Spirito, A. (2018). Adolescent alcohol use: The effects of parental knowledge, peer substance use, and peer tolerance of use. *Journal of the Society for Social Work and Research, 9*, 69-87. doi:10.1086/695809.

Serafini, K. A. & Stewart, D. G. (2015). Perceptions of family alcohol use in a young adult sample. *The Yale Journal of Biology and Medicine, 88*, 205-209.

Simons-Morton, B., Haynie, D. L., Crump, A. D., Saylor, K. E., Eitel, P. & Yu, K. (1999). Expectancies and other psychosocial factors associated with alcohol use among early adolescent boys and girls. *Addictive Behaviors, 24*, 229-238.

Simons-Morton, B., Haynie, D., Liu, D., Chaurasia, A., Li, K. & Hingson, R. (2016). The effect of residence, school status, work status, and social influence on the prevalence of alcohol use among emerging adults. *Journal of Studies on Alcohol and Drugs, 77*, 121-132. doi:10.15288/jsad.2016.77.121.

Steinberg, L. (2014). Adolescence, (10nd ed.). Boston, MA: McGraw-Hill.

Stormshak, E. A., Comeau, C. A. & Shepard, S. A. (2004). The relative contribution of sibling deviance and peer deviance in the prediction of substance use across middle childhood. *Journal of Abnormal Child Psychology, 32*, 635-649.

Tuunanen, M., Aalto, M. & Seppä, K. (2007). Binge drinking and its detection among middle-aged men using AUDIT, AUDIT-C and AUDIT-3. *Drug and Alcohol Review, 26*, 295-299.

Varela, J., Carrera, A., Rial, A., Braña, T. & Osorio, J. (2006). Identificación dos trastornos debidos ao consumo de alcohol. Unha adaptación do AUDIT á poboación galega. Santiago de Compostela: Xunta de Galicia-Consellería de Sanidade-Sergas.

Voogt, C., Beusink, M., Kleinjan, M., Otten, R., Engels, R., Smit, K. & Kuntsche, E. (2017). Alcohol-related cognitions in children (aged 2-10) and how they are shaped by parental alcohol use: A systematic review. *Drug and Alcohol Dependence, 177*, 277-290. doi:10.1016/j.drugalcdep.2017.04.006.

Weitzman, E.R., Nelson, T.F. & Wechsler, H. (2003). Taking up binge drinking in college: The influences of person, social group, and environment. *The Journal of Adolescent Health, 32*, 26-35. doi:10.1016/s1054-139x(02)00457-3.

White, H. R., Fleming, C. B., Kim, M. J., Catalano, R. F. & McMorris, B. J. (2008). Identifying two potential mechanisms for changes in alcohol use among college-attending and non-college-attending emerging adults. *Developmental Psychology, 44*, 1625-1639. doi:10.1037/a0013855.

Whiteman, S. D., Jensen, A. C. & Maggs, J. L. (2013). Similarities in adolescent siblings' substance use: Testing competing pathways of influence. *Journal of Studies on Alcohol and Drugs, 74*,104-113. doi:10.15288/jsad.2013.74.104.

Whiteman, S. D., Jensen, A. C., Mustillo, S. A. & Maggs, J. L. (2016). Understanding sibling influence on adolescents' alcohol use: Social and cognitive pathways. *Addictive Behaviors, 53*, 1-6. doi:10.1016/j.addbeh.2015.09.007.

Wicki, M., Kuntsche, E. & Gmel, G. (2010). Drinking at European universities? A review of students' alcohol use. *Addictive Behaviors, 35*, 913-924. doi:10.1016/j.addbeh.2010.06.015.

Willett, W. C., Sacks, F., Trichopoulou, A., Drescher, G., Ferro-Luzzi, A., Helsing, E. & Trichopoulos, D. (1995). Mediterranean diet pyramid: a cultural model for healthy eating. *The American Journal of Clinical Nutrition, 61*, 1402-1406. doi:10.1093/ajcn/61.6.1402S.

Wilsnack, R. W., Wilsnack, S. C. & Obot, I. S. (2005). Why study gender, alcohol and culture?. En I. S. Obot & R. Room (Eds), Alcohol, gender and drinking problems: Perspectives from low- and middle income countries (pp. 1-23). Geneva: World Health Organization.

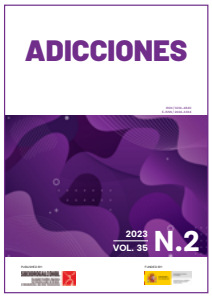
Windle, M., Haardörfer, R., Lloyd, S. A., Foster, B. & Berg, C. J. (2017). Social influences on college student use of tobacco products, alcohol, and marijuana. *Substance Use and Misuse, 52*, 1111-1119. doi:10.1080/10826084.2017.1290116.

Wood, M. D., Read, J. P., Mitchell, R. E. & Brand, N. H. (2004). Do parents still matter? Parent and peer influences on alcohol involvement among recent high school graduates. *Psychology of Addictive Behaviors, 18*, 19-30. doi:10.1037/0893-164X.18.1.19.

World Health Organization. (2018). Global status report on alcohol and health 2018. Geneva: WHO.

SOCIDROGALCOHOL
Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y las otras Toxicomanías

ADICCIONES
2023 ■ VOL. 35 ■ N. 2 ■ PAGES 135–142
www.adicciones.es



ORIGINAL

The relevance of patterns of use: A survey to assess cannabis use related harm

La importancia de los patrones de consumo: Diseño de una encuesta que permita evaluar daño relacionado al consumo de cannabis

Eugènia Campeny*, Hugo López-Pelayo*, Antoni Gual*, Maria de las Mercedes Balcells-Olivero*.

* Institut d'Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), Barcelona, España; Grup Recerca Addiccions Clinic (GRAC-GRE) Departamento de Psiquiatría, Instituto de Neurociencias, Hospital Clínic, Universitat de Barcelona, España.

Abstract

Lifetime prevalence of cannabis use is estimated 192 million adults worldwide (2017) and has increased by 16% in the last decade. However, data on quantity and frequency of use that can lead to harm is lacking. We have developed a survey to assess patterns of cannabis use and related harms in a sample of cannabis users. This paper focuses on evaluating the feasibility of the survey and the users' satisfaction in a pilot sample. Forty cannabis users were recruited (>18 years old, living in Spain, cannabis use at least once during the last 12 months) between December 2018 and January 2019. Participants answered an online survey (mental health, organic harm and injury) and an ad hoc questionnaire to assess accessibility, feasibility, satisfaction, design and content appropriateness. Of the participants, 93.23% (n = 37.3) were satisfied with the design, 94.92% (n = 38.2) were satisfied with the content, and 94.73% (n = 37.0) were satisfied with the accessibility of the survey; only minor changes were required to improve feasibility and accessibility. Participants used a median of 1.0 Standard Joint Unit per day (Interquartile Range [IQR] 1.0-2.0). Of the sample, 92.5% reported at least one related harm and suffers a median of 4.0 disorders (IQR, 1.25-5.0). The present study allows for designing a feasible online survey to conduct a cross-sectional study with a larger sample.

Keywords: cannabis, risk, harm, THC, survey, online

Resumen

Globalmente, 192 millones de adultos han consumido cannabis alguna vez en su vida (2017), un consumo que se ha incrementado en un 16% en la última década. Sin embargo, seguimos sin tener información clara sobre qué cantidad y qué frecuencia de consumo va a causar daño. Por tanto, este proyecto desarrolla una encuesta para evaluar los patrones de consumo de cannabis y los daños relacionados en una muestra de consumidores. Este artículo se centra en mostrar la factibilidad de la encuesta y la satisfacción de los usuarios en una muestra piloto. Cuarenta usuarios de cannabis fueron reclutados (> 18 años, viviendo en España, consumo de cannabis mínimo una vez en los últimos 12 meses) entre diciembre de 2018 y enero de 2019. Los participantes respondieron una encuesta en línea (consumo cannábico, salud mental, organicidad y lesiones) y un cuestionario ad hoc para evaluar la accesibilidad, factibilidad, satisfacción, diseño y contenido. El 93,23% de participantes estaba satisfecho con el diseño; el 94,92% estaba satisfecho con el contenido y el 94,73% estaba satisfecho con la accesibilidad de la encuesta, y fueron necesarios solo cambios menores para mejorar la factibilidad y la accesibilidad de algunos ítems. Los participantes consumieron una mediana de 1,0 Unidades de Porro Estándar por día (Rango Intercuartílico [RIQ] 1,0-2,0). El 92,5% de la muestra puntuó como mínimo en un daño relacionado y con una mediana de 4,0 patologías (RIQ 1,25-5,0). El presente estudio nos permite diseñar una encuesta en línea con determinada factibilidad que pueda ser usada en un estudio transversal a gran escala.

Palabras clave: cannabis, riesgo, daño, THC, encuesta, en línea

■ *Received: May 2020; Accepted: February 2021.*

■ ISSN: 0214-4840 / E-ISSN: 2604-6334

■ **Send correspondence to:**
Eugènia Campeny de Lara. Institut d'Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), Grup de Recerca Addiccions Clínic (GRAC-GRE), Departamento de Psiquiatría, Hospital Clínic. C/ Mallorca 183, 08036 Barcelona, España. Tel: +34 93 227 54 00.E-mail: eugeniacdelara@copc.cat

Cannabis is the third most used psychoactive substance worldwide, after alcohol and tobacco. The annual global estimated prevalence of cannabis during 2017 was about 3.8%, meaning 192 million people, aged between 15-64 years, used cannabis at least once (16% of increase in the last decade) (United Nations Office on Drugs and Crime, 2019).

Since 2017 non-medical use of cannabis has been allowed in different countries worldwide (ten states of the USA, District of Columbia, Uruguay and Canada). After legalization, cannabis use in Colorado (the first state in the US that legalized cannabis) has significantly increased (European Monitoring Centre of Drugs and Drug Addiction, 2020). Cannabis-related injuries (i.e. emergency room visits, traffic deaths, hospital admissions or driving under the influence of cannabis) have also increased significantly (United Nations Office on Drugs and Crime, 2019). When cannabis availability increases and, at the same time, the population has a low perception of harm risks, cannabis use increases in early ages, and could contribute to higher cannabis use prevalence in the future (Parker & Anthony, 2018; United Nations Office on Drugs and Crime, 2018).

Experience regarding tobacco or alcohol prevention allows us to learn that easy accessibility to the substance causes a high impact on both health and social functions (Montes, Pérez & Gestal, 2004; Villalbí, 2002). However, when prevention policies are implemented, including frequency and quantity of use (e.g., Standard Drink Unit for alcohol), which allow identifying risky use, social and health costs are reduced and improved (Montes et al., 2004; Villalbí, 2002). Risky use is defined as "a pattern of substance use that increases the risk of harmful consequences for the user", that also "are of public health significance despite the absence of any current disorder in the individual user" (World Health Organization, 2010b).

Hence, prevention strategies and interventions for cannabis harmful use must be implemented in a controlled manner that allows validation and measures of efficacy (Chapman, 1993; Karlsson & Österberg, 2004), but a consensus for risky use that include standard measures of frequency and quantity is still lacking (Casajuana et al., 2016).

A systematic review of screening and diagnostic instruments to assess cannabis use disorders found that even those instruments with the best performance (CAST, CUDIT, DUDIT and ASSIST) were difficult to implement. In fact, current instruments do not take into account frequency and amount of cannabis used, leading to confusing interpretations of patterns of use. In addition, authors conclude that new designed instruments should include "cannabis potency, dose, patterns of use and health consequences"(López-Pelayo, Batalla, Balcells, Colom & Gual, 2015).

In order to establish a consensus of what can be considered risky use of cannabis there must be: a) evidence-based data including all dimensions of harm; b) an instrument that measures cannabis use associated harm, which includes frequency and quantity.

However, those two items are still missing in the cannabis field, which in fact are essential (Campeny et al., 2020; Casajuana et al., 2018). As a first step, a "Standard Joint Unit" (SJU) based on 9-delta-THC cannabinoid quantity present in joints was established (Casajuana Kögel et al., 2017a). As a second step, the Spanish Ministry of Health, through its National Plan on Drugs, approved a project to define risky cannabis use. We have developed a tool to assess patterns of use and associated problems in a sample of cannabis users. This pilot study aims: 1) to assess the feasibility of an online survey for exploring risky cannabis use; 2) to assess satisfaction, accessibility, design and content appropriateness of the survey.

Methods

Participants and setting

The pilot study was designed according to the study protocol (under review). The pilot study was conducted in Spain from December 2018 to January 2019. A stratified random sample of 40 people was recruited during a three months period. Adults (>18 years old), living in Spain, that have used cannabis at least once during the last twelve months were eligible to participate. The exclusion criteria were: a) idiomatic barriers; b) incapacity to sign the informed consent; c) visual incapacity; d) no access to the Internet.

In order to recruit a sample of 40 users, an online survey (described below) was distributed via flyers and community advertisements among Spanish healthcare facilities, universities, websites, cannabis associations and internal networks.

Instruments

An online survey was designed based on the results obtained on a systematic review of cannabis use related psychological and physical harm (Campeny et al., 2020). The survey was formed by a combination of validated instruments in the local language (when available in the literature) and an ad hoc questionnaire, and resulted in 55 questions that can be divided into four groups: a) socio-demographics (gender, age, civil status, education and working status); b) other substance use (alcohol, tobacco, cocaine, opioids, amphetamines, LSD, benzodiazepines without prescription); c) patterns of cannabis use (the type of cannabis derivate used, administration via, frequency of cannabis use during the last 30 days, Standard Joint Unit [Casajuana Kögel et al., 2017a; Freeman & Lorenzetti, 2019] per occasion, the proportion of tobacco used in the joints, age at first use, age at regular use); d) health status

Table 1. ***Survey instruments.***

	Validated instruments	Ad-hoc instruments
Socio-demographic		Study Working status Civil status Age Gender Residence
Pattern of other drugs use	Audit-C (García Carretero, Novalbos Ruiz, Martínez Delgado & O'Ferrall González, 2016)	Tobacco use Other drugs use
Pattern of cannabis use	SJU (Casajuana Kögel et al., 2017a)	Type of cannabis used Tobacco percentage Cannabis precedence Age at first use Age at regular use
Mental Health	PHQ-9 (Diez-Quevedo, Rangil, Sanchez-Planell, Kroenke & Spitzer, 2001) GAD-7 (Garcia-Campayo et al., 2010) CAD-4 (Pedrero Pérez et al., 2007)	Mental health diagnosis
Organic	The WHO health and health response capacity questionnaire (World Health Organization, 2000)	Organic affectations
Injury		Motor vehicle collision Suicidal behavior Violence

Table 2. ***Ad-hoc questionnaire to assess feasibility, design, content and accessibility of the survey.***

	Ad-hoc questions (original language: Spanish)
Design	Q1. ¿Qué aspectos del diseño modificarías?
	Q2. ¿Qué opinas de los colores utilizados? (el color del fondo, el de las letras, la combinación...)
	Q3. ¿Y del diseño de las preguntas? (formulación de las preguntas, claridad, largas/cortas...)
	Q4. ¿El diseño de las preguntas ayudaba a responder de manera rápida?
Content	Q5. ¿Qué aspectos del contenido del cuestionario cambiarías?
	Q6. ¿Te ha parecido aburrido? ¿Por qué?
	Q7. ¿Te ha parecido denso? ¿Por qué?
	Q8. ¿Echas en falta alguna pregunta?
	Q9. ¿Qué dificultades te has encontrado a lo largo del cuestionario?
	Q10. ¿Preguntarías algo de manera diferente?
	Q11. ¿Te sobra alguna pregunta del cuestionario?
Accessibility	Q12. ¿Desde qué dispositivo has respondido el cuestionario?
	Q13. ¿Crees que no estaba adaptado al dispositivo con el cual has respondido?
	Q14. ¿Te ha sido difícil acceder al cuestionario? ¿Por qué?
	Q15. Al entrar a la web, ¿has tenido dificultades para encontrar el enlace?

(mental and organic) and injury background. For more information about the survey instruments see table 1.

Since the main objective of the survey is to define the cannabis use related harm, health status and injury background were given higher relevance. The questionnaire asked about:

- Mental health: gambling disorder (CAD-4 [Pedrero Pérez et al., 2007]), depressive disorder screening (PHQ-3 [Diez-Quevedo, Rangil, Sanchez-Planell, Kroenke & Spitzer, 2001]), anxiety disorder screening (GAD-3 [Garcia-Campayo et al., 2010]), psychotic disorders and bipolar disorder (ad hoc questions). Participants with depressive and/or anxiety symptoms were asked to answer the PHQ-9 (Diez-Quevedo et al., 2001) and GAD-7 (Garcia-Campayo et al., 2010) respectively.
- Organic/somatic affectation: heart diseases, bronchitis or emphysema, respiratory infections, migraine, sleep difficulties, COPC, gastritis or ulcer, vomits or diarrhea, cancer (ad hoc questions), comprehension, motor coordination and working difficulties (questions regarding cognitive impairment from the WHO health and health response capacity questionnaire (World Health Organization, 2000)).
- Injury background: motor vehicle collisions, suicidal ideation, suicidal attempt, violence perpetration (ad hoc questions). Participants who reported suffering a motor vehicle collision were asked whether they had used cannabis during the previous six hours and whether they were held responsible of the collision.

After completing the online survey, the participants answered an ad-hoc questionnaire to assess accessibility, feasibility, satisfaction, design and content appropriateness through phone calls. Given that the aim of the present study is to define feasibility and satisfaction, the ad-hoc questionnaire is outlined in table 2.

Data analysis

Feasibility, satisfaction, design, content and accessibility were analyzed with frequencies and percentages (qualitative variables) or mean and Standard Deviations (SD). Users' comments and suggestions from the ad-hoc questionnaire were taken into account in order to improve the survey. Sociodemographic characteristics, pattern of use and other drugs use were analyzed with percentages (qualitative variables) or median and interquartile range (IQR) (quantitative variables). The results from the survey were analyzed with median and IQR (quantitative variables).

Ethical considerations

This study was conducted fulfilling the Helsinki Declaration (current version; Fortaleza, Brazil, October 2013) and according to the protocol and legal pertinent requirements (Law 14/2007 of July 3rd, of biomedical research). This study was approved by the ethics committee of the Hospital Clinic of Barcelona and Institut d'Investigacions Biomèdiques August Pi i Sunyer (HCB/2017/0795). An online informed consent was asked to accept to all users.

Results

Participants were mostly male (65%), young adults (median age 28 IQR 25.5-30.0) and single (57.5%) or married/ with a couple (42.5%). 40% had a university degree, and 65% were working. For more details on socio-demographic characteristics see supplementary material.

Satisfaction and accessibility

93.67% (SD 4.33) of participants were satisfied with design; 95.63% (SD 9.34) of participants were satisfied with the content; and 94.73% (SD 8.66) of participants were satisfied with the survey accessibility. The 10% of participants referred to have difficulties registering euros spent and grams used per day, as they do not use cannabis daily. Hence, the question was reformulated resulting in a weekly registration instead of daily registration. For more details see table 3.

Content, design and feasibility

After conducting the online survey statistical analysis, two limitations arise: 1) Results regarding family violence were difficult to analyze and interpret by researchers as data was heterogeneous, and also specific information about violence perpetration was impossible to gather. Hence, questions were reformulated into structured questions and responses ("¿Ha tenido enfados en el ámbito familiar? Especifique qué tipo de enfados" to "¿Ha vivido alguna de las siguientes situaciones en su núcleo familiar? (Enfados con violencia verbal (insultos, alzar la voz, etc.); Enfados con violencia física; No; Otras, especificar) ¿Quién ha ejercido violencia física? (Padre/madre sobre usted; Pareja sobre usted; Hijo/s sobre usted; Usted sobre su padre/madre; Usted sobre su pareja; Usted sobre sus hijo/s; Otras, especificar)); 2) The registration of frequency of other drug use required modifications as the question's formulations were found confusing by users and could lead to incongruent responses difficult to analyze and interpret.

After the global analysis of the results, two new sections were added to the survey: 1) A new item that measures

Table 3. ***Design, content and accessibility results.***

Dimension	Questions	Positive responses				Positive responses
		N (%)		Mean	Standard Deviation (SD)	
Design	Question 1 (Q1)	38(95)		93.67	4.33	The SJU daily registration and other drugs use questions were difficult to answer
	Question 2 (Q2)	39(97.5)				
	Question 3 (Q3)	35(87.5)				
	Question 4 (Q4)	38(95)				
Content	Question 5 (Q5)	40(100)		95.63	9.34	Users miss the following sections: sport, job, dependence, sociability, asking more about patterns of cannabis use.
	Question 6 (Q6)	39(97.5)				
	Question 7 (Q7)	30(75)				
	Question 8 (Q8)	40(100)				
	Question 9 (Q9)	40(100)				
	Question 10 (Q10)	40(100)				
	Question 11 (Q11)	40(100)				
Accessibility	Question 12 (Q12)	Mobile	Personal Computer	N/A	N/A	The page refreshes automatically, so they have to start again from the beginning
		36(90)	4(10)			
	Question 13 (Q13)	31(85)		94.73	8.66	
	Question 14 (Q14)	40(100)				
	Question 15 (Q15)	40(100)				

cannabis use dependence (through SDS interview (Vélez-Moreno et al., 2013)) in order to assess severity; 2) Information about existing public addiction services and specific counseling for participants with suicidal ideation and/or attempts at the end of the survey for ethical purposes.

For more details see table 3.

Preliminary data

Participants used a median of 1.0 Standard Joint Unit (SJU) per day (IQR 1.0-2.0). First use of cannabis was at 15.0 (median) years old (IQR 14.0-16.0). Age of regular use was at 18.0 (median; IQR 16.5-22.0). The sample used hashish (68%) or marihuana (35%). The use of cannabis in the last 30 days was 18.5 days (median; IQR 1.25-30.0). The median of tobacco in each joint was 75.0% (IQR 50.0-75.0) (see Table 3).

The 95.0% (38) of the sample reported at least one related harm, and suffers a median of 4.0 disorders (IQR, 2.0-6.0). For more details on description of cannabis-related harms see supplementary material.

Discussion

The present study aims to design a feasible survey that informs about cannabis use related harm. Based on the obtained results, the survey is accessible, and design and content are appropriate.

There is evidence regarding cannabis related harms (Hall, 2015; The National Academies of Sciences Engineering Medicine, 2017; World Health Organization, 2010a). However, current literature does not inform about a global view of harms and risks of using cannabis (Campeny et al., 2020; Fischer, Rehm & Hall, 2009).

This study aims to design a feasible survey that globally analyzes the consequences of cannabis use, taking into account all dimensions of human health (mental, organic and lesions). The difficulty that arises from this global view of harm is that an accurate design, including content and accessibility appropriateness, is required. As a response to this difficulty, a pilot study should be conducted (Van Teijlingen, Rennie, Hundley & Graham, 2001).

Results indicate that the instrument informs allows recruiting information about patterns of cannabis use (including frequency, quantity and amount), mental health, organic health and injury. Furthermore, in order to improve feasibility, to complete the global impact of cannabis use, information about the severity of cannabis use was obtained through the SDS interview (Vélez-Moreno et al., 2013).

The survey was accessible, and the content and design were appropriate based on participants' answers. Responders were satisfied with the survey. Only a specific question needed modifications, as some subjects referred incongruence to its formulation. In general, participants easily accessed the survey and did not differ with its content. Information about the treatment source must be added due to ethical considerations. These results are consistent with current literature that supports that online surveys as an appropriate tool which allows collecting information from a larger sample of users via web (Matias et al., 2019). Furthermore, it can be a potent instrument to quickly and inexpensively collect information from drug use population (Matias et al., 2019).

However, some limitations arise. Our sample is mostly formed by male young adults and may not represent the totality of cannabis users, as, for instance, organic harm (i.e. respiratory diseases) may be incremented with age (Akgün, Crothers & Pisani, 2012; Rossi, Ganassini, Tantucci & Grassi, 1996). In addition, the use of other psychoactive substances is also related with burden disease (Karila, Petit, Lowenstein & Reynaud, 2012; Maritz & Mutemwa, 2012; Morris et al., 2018; World Health Organization, 2018). Hence, our results must be interpreted with caution, as for a small sample potential bias might be interfering results. The exposed potential bias must be taken into account in the main study and future research.

In conclusion, the present study allows us to move forward designing and conducting an improved survey, in order to conduct a cross-sectional study with a larger sample. This step is of great importance, as it will have further implications to prevention and treatment for cannabis users at risk.

Acknowledgements

This study is funded by the Spanish grant of Plan Nacional Sobre Drogas, Ministerio de Sanidad y Consumo (PNSD 132373 - 2017I053 - 603; Antoni Gual Solé). The conclusions of the article are only the responsibility of the authors and do not necessarily represent the official views of the institutions, who had no further role in study design; collection, analysis and interpretation of the data; in the writing of the paper; or in the decision to submit the paper for publication. This work is supported by the following institutions: Institut d'Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), University of Barcelona, Hospital Clínic i Universitari de Barcelona and CERCA Programme / Generalitat de Catalunya.

HLP receives funding from the Spanish Ministry of Science, Innovation and Universities, Instituto de Salud Carlos III through a 'Juan Rodes' contract (JR19/00025).

MB-O, AG and HL-P designed the study. EC and MB-O wrote the first draft of the manuscript. All the other authors reviewed and approved the final paper.

CERCA Programme / Generalitat de Catalunya. Institut d'Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), University of Barcelona, Hospital Clínic i Universitari de Barcelona (ICN). Plan Nacional Sobre Drogas, Ministerio de Sanidad y Consumo.

Conflict of interests

Authors declare that they have no competing interests related to this work.

References

Akgün, K. M., Crothers, K. & Pisani, M. (2012). Epidemiology and management of common pulmonary diseases in older persons. *Biological Sciences*, *67A*, 276–291. doi:10.1093/gerona/glr251.

Campeny, E., López-Pelayo, H., Nutt, D., Blithikioti, C., Oliveras, C., Nuño, L.,… Gual, A. (2020). The blind men and the elephant: Systematic review of systematic reviews of cannabis use related health harms. *European Neuropsychopharmacology*, *33*, 1-35. doi:10.1016/j.euroneuro.2020.02.003.

Casajuana, C., López-Pelayo, H., Balcells, M. M., Miquel, L., Colom, J. & Gual, A. (2016). Definitions of risky and problematic cannabis use: A systematic review. *Substance Use and Misuse*, *51*, 1760–1770. doi:10.1080/10826084.2016.1197266.

Casajuana, C., López-Pelayo, H., Miquel, L., Balcells-Oliveró, M. M., Colom, J. & Gual, A. (2018). Quantitative criteria to screen for cannabis use disorder. *European Addiction Research*, *24*, 109–117. doi:10.1159/000488346.

Casajuana Kögel, C., Balcells-Olivero, M. M., López-Pelayo, H., Miquel, L., Teixidó, L., Colom, J.,… Gual, A. (2017a). The standard joint unit. *Drug and Alcohol Dependence*, *176*, 109–116. doi:10.1016/j.drugalcdep.2017.03.010.

Chapman, S. (1993). *Unravelling gossamer with boxing gloves: problems in explaining the decline in smoking. British Medical Journal, 307,* 429–432. doi:10.1136/bmj.307.6901.429.

Diez-Quevedo, C., Rangil, T., Sanchez-Planell, L., Kroenke, K. & Spitzer, R. L. (2001). Validation and utility of the patient health questionnaire in diagnosing mental disorders in 1003 general hospital Spanish inpatients. *Psychosomatic Medicine*, *63*, 679–686. doi:10.1097/00006842-200107000-00021.

European Monitoring Centre of Drugs and Drug Addiction. (2020). *Monitoring and evaluating changes in cannabis policies: Insights from the Americas About the EMCDDA I Legal notice*. Luxembourg. doi:10.2810/151487.

Fischer, B., Rehm, J. & Hall, W. (2009). Cannabis use in Canada: The need for a "public health" approach. *Canadian Journal of Public Health*, *100*, 101–103.

Freeman, T. P. & Lorenzetti, V. (2019). 'Standard THC Units': A proposal to standardise dose across all cannabis products and methods of administration. *Addiction, 115,* 1207-1216. doi:10.1111/add.14842.

Garcia-Campayo, J., Zamorano, E., Ruiz, M. A., Pardo, A., Perez-Paramo, M., Lopez-Gomez, V.,… Rejas, J. (2010). Cultural adaptation into Spanish of the generalized anxiety disorder-7 (GAD-7) scale as a screening tool. *Health and Quality of Life Outcomes*, *8*, 8. doi:10.1186/1477-7525-8-8.

García Carretero, M. Á., Novalbos Ruiz, J. P., Martínez Delgado, J. M. & O'Ferrall González, C. (2016). Validación del test para la identificación de trastornos por uso de alcohol en población universitaria: AUDIT y AUDIT-C. *Adicciones*, *28*, 194-204. doi:10.20882/adicciones.775.

Hall, W. (2015). What has research over the past two decades revealed about the adverse health effects of recreational cannabis use? *Addiction*, *110*, 19–35. doi:10.1111/add.12703.

Karila, L., Petit, A., Lowenstein, W. & Reynaud, M. (2012). Diagnosis and consequences of cocaine addiction. *Current Medicinal Chemistry*, *19*, 5612–5618. doi:10.2174/092986712803988839.

Karlsson, T. & Österberg, E. (2004). Alcohol policies in EU member states and Norway. A collection of country reports. *Health Promotion*.

López-Pelayo, H., Batalla, A., Balcells, M. M., Colom, J. & Gual, A. (2015). Assessment of cannabis use disorders: A systematic review of screening and diagnostic instruments. *Psychological Medicine*, *45*, 1121–1133. doi:10.1017/S0033291714002463.

Maritz, G. S. & Mutemwa, M. (2012). Tobacco smoking: Patterns, health consequences for adults, and the long-term health of the offspring. *Global Journal of Health Science*, *4,* 62–75. doi:10.5539/gjhs.v4n4p62.

Matias, J., Kalamara, E., Mathis, F., Skarupova, K., Noor, A. & Singleton, N. (2019). The use of multi-national web surveys for comparative analysis: Lessons from the European Web Survey on Drugs. *International Journal of Drug Policy*, *73,* 235-244. doi:10.1016/j.drugpo.2019.03.014.

Montes, A., Pérez, M. & Gestal, J. J. (2004). Impacto del tabaquismo sobre la mortalidad en España. *Adicciones*, *16*, 75–82.

Morris, D. H., Davis, A. K., Lauritsen, K. J., Rieth, C. M., Silvestri, M. M., Winters, J. J. & Chermack, S. T. (2018). Substance use consequences, mental health problems, and readiness to change among veterans seeking substance use treatment. *Journal of Substance Abuse Treatment*, *94*, 113–121. doi:10.1016/j.jsat.2018.08.005.

Parker, M. A. & Anthony, J. C. (2018). Population-level predictions from cannabis risk perceptions to active cannabis use prevalence in the United States, 1991–2014. *Addictive Behaviors*, *82*, 101–104. doi:10.1016/J.ADDBEH.2018.02.030.

Pedrero Pérez, E. J., Rodríguez Monje, M. T., Gallardo Alonso, F., Fernández Girón, M., Pérez López, M. & Chicharro Romero, Y. J. (2007). Validación de un instrumento para la detecciónde trastornos de control de impulsos y adicciones: El MULTICAGE CAD-4. *Trastornos Adictivos*, *9*, 269–278.

Rossi, A., Ganassini, A., Tantucci, C. & Grassi, V. (1996). Aging and the respiratory system. *Aging Clinical and Experimental Research, 8,* 143-161. doi:10.1007/bf03339671.

The National Academies of Sciences Engineering Medicine. (2017). *The health effects of cannabis and cannabinoids: The current state of evidence and recommendations for research.* Washington, DC: The National Academies Press.

United Nations Office on Drugs and Crime. (2018). *World Drug Report*. Retrieved at https://www.unodc.org/wdr2018/prelaunch/Pre-briefingAM-fixed.pdf.

United Nations Office on Drugs and Crime. (2019). *Cannabis and hallucinogens*. Retrieved at https://www.unilibrary.org/content/books/9789210041744c005.

Van Teijlingen, E. R., Rennie, A. M., Hundley, V. & Graham, W. (2001). The importance of conducting and reporting pilot studies: The example of the Scottish Births Survey. *Journal of Advanced Nursing*, *34*, 289–295.

Vélez-Moreno, A., González-Saiz, F., Ramírez López, J., Torrico Linares, E., Fernández-Calderón, F., Rojas, A. J. & Lozano, Ó. M. (2013). Adaptación al español de la Substance Dependence Severity Scale: Resultados preliminares. *Adicciones*, *25*, 339–347. doi:10.20882/adicciones.36.

Villalbí, J. R. (2002). *El tabaco como problema de salud pública.* Retrieved at https://www.sespas.es/informe2002/cap07.pdf.

World Health Organization. (2000). Encuesta de la OMS sobre salud y capacidad de respuesta del sistema de salud Secciones del cuestionario. Retrieved at http://www.who.int/responsiveness/surveys/Long_90_ min_ Questionnaire (Spanish).pdf.

World Health Organization. (2010a). Alcohol, Drugs and Addictive Behaviours. Retrieved at http://www.who.int/substance_abuse/facts/cannabis/en/.

World Health Organization. (2010b). *WHO | Lexicon of alcohol and drug terms published by the World Health Organization*. Geneva: World Health Organization.

World Health Organization. (2018). *Global status report on alcohol and health 2018*. Retrieved at https://apps.who.int/iris/bitstream/handle/10665/274603/9789241565639-eng.pdf?ua=1.

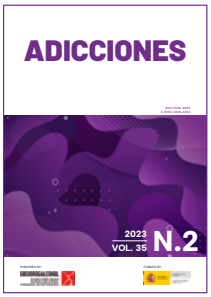
Supplementary material

Sociodemographic and clinical characteristics.

	n (40)	%	Median	IQR
Men	26	65.0		
Age			28.0	25.5-30.0
Civil Status				
Single	23	57.5		
Married/with a couple	17	42.5		
Education Level				
High school	16	40.0		
University	23	57.5		
Working status				
Working	26	65.0		
Unemployed	3	7.5		
Studying	1	2.5		
Working and studying	10	25.0		
Derivate of cannabis used				
Hashish	26	68.0		
Marihuana	14	35.0		
Days of cannabis use in the last 30 days			18.5	1.25-30.0
Standard Joint Unit			1	1.0-2.0
Grams/day of use			0.25	0.25-0.5
Joints/day of use			1	1.0-2.0
Euros/day of use			2	1.0-4.0
Percentage of tobacco in the joint			75.0	50.0-75.0
Age at first cannabis consumption			15.0	14.0-16.0
Age at regular cannabis use			18.0	16.5-22.0
Cannabis administration via				
Smoked	39	97.5		
Other drugs use in the past				
Cocaine	13	32.5		
Opioids	3	7.5		
Amphetamines	7	17.5		
LSD	4	10.0		
Benzodiazepines without a prescription	1	2.5		
Other drugs use in the present				
Cocaine	5	12.5		
Opioids	1	2.5		
Amphetamines	0	0.0		
LSD	1	2.5		
Benzodiazepines without a prescription	0	0.0		
At least one related disorder (CU at least once during the last 30 days)	38	95.0	4	2.0-6.0
Mental health dimension	36	90,0	2	1.0-2.0
Organic dimension	23	57.5	1	0.0-2.0
Injury dimension	29	72.5	1	0.0-2.0

SOCIDROGALCOHOL
Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y las otras Toxicomanías

ADICCIONES
2023 ■ VOL. 35 ■ N. 2 ■ PAGES 143–150
www.adicciones.es



ORIGINAL

Self-reported increase in alcohol and drugs intake as a coping strategy in hospital workers during COVID-19 outbreak: A cross-sectional study

Incremento de la ingesta de alcohol y drogas como estrategia de afrontamiento en trabajadores hospitalarios durante el brote de COVID-19: Estudio transversal

Agustín Madoz-Gúrpide*,**,***, Mónica Leira-Sanmartín*, Ángela Ibáñez*,**,***,****, Enriqueta Ochoa-Mangado*,**,***.

* Departamento de Psiquiatría. Hospital Universitario Ramón y Cajal, Madrid, España.
** Instituto Ramón y Cajal de Investigación Sanitaria, Madrid, España.
*** Departamento de Medicina y Especialidades Médicas. Universidad de Alcalá, Madrid, España.
**** Centro de Investigación Biomédica en Red de Salud Mental (CIBERSAM).

Abstract

Situations of psychological stress, such as the current COVID-19 pandemic, could lead to an increase in the consumption of alcohol and other drugs of abuse as an inadequate coping strategy in health workers. This study aimed to investigate the intake of alcohol and drugs of abuse in hospital workers during the first wave of COVID-19. A further focus was to define the worker profile most vulnerable to this behavior through a logistic regression analysis. A cross-sectional study in a tertiary hospital in Madrid, Spain, during the first wave of COVID-19 was designed. Information was collected from a sample (n = 657) of healthcare workers (n = 536) and non-healthcare workers (n = 121). An online survey (including questions about basic health habits, working environment conditions, sociodemographic data, and the 12-item version of the General Health Questionnaire as a measure of psychological well-being) was conducted. Increased consumption of alcohol and/or drugs of abuse during the analyzed period of the pandemic was reported by 17.1% of workers. The following variables were associated with a higher probability of increased consumption of alcohol and/or drugs of abuse: male gender (p = .044), living alone or without dependents (p = .005), staff physician or resident (p = .010), having worked on the COVID frontline (p = .058), poor nutritional habits (p = .004) and self-prescription of psychotropic drugs to manage anxiety and insomnia (p = .003). A significant percentage of hospital workers increased their consumption of alcohol and drugs of abuse during the first wave of the COVID-19 pandemic. A professional risk profile can be defined for this practice.

Key words: coronavirus disease 2019 (COVID-19), health personnel, psychological stress, risk factors, protective factors, alcohol consumption, drug abuse

Resumen

Las situaciones de estrés psicológico, como la actual pandemia COVID-19, pueden implicar un aumento del consumo de alcohol y otras drogas de abuso como estrategia inadecuada de afrontamiento en profesionales sanitarios. Esta investigación tiene como objetivo estudiar el incremento de la ingesta de alcohol y drogas de abuso en los trabajadores hospitalarios. Persigue también, mediante un análisis de regresión logística, definir qué perfil de trabajador es el más vulnerable a este comportamiento. Para ello se realizó un estudio transversal en un hospital terciario en Madrid, España, durante la primera oleada de COVID-19. Participaron en el estudio un total de 657 trabajadores del hospital, 536 de ellos sanitarios y 121 no sanitarios. La recogida de datos se realizó a través de una encuesta en línea que incluía preguntas sobre hábitos básicos de salud, condiciones del entorno laboral, datos sociodemográficos, así como la versión de 12 ítems del Cuestionario de Salud General. El 17,1% declaró haber aumentado su consumo de alcohol y/o drogas de abuso durante el período analizado. Se asoció a una mayor probabilidad de dicho incremento: sexo masculino (p = ,044), vivir sin personas dependientes a cargo (p = ,005), ser médico adjunto o residente (p = ,010), haber trabajado en primera línea de COVID (p = ,058), presentar malos hábitos nutricionales (p = ,004) y realizar autoprescripción de fármacos psicotrópicos para controlar la ansiedad y el insomnio (p = ,003). Un porcentaje significativo de los trabajadores hospitalarios ha aumentado su consumo de alcohol y drogas de abuso durante la primera oleada de la pandemia COVID-19, existiendo un perfil de mayor riesgo para esta práctica.

Palabras clave: infección por coronavirus 2019, personal de salud, estrés psicológico, factores de riesgo, factores protectores, abuso de alcohol, abuso de sustancias

■ *Received: November 2020; Accepted: July 2021.*

■ ISSN: 0214-4840 / E-ISSN: 2604-6334

■ **Send correspondence to:**
Agustín Madoz-Gúrpide. Departamento de Psiquiatría. Hospital Universitario Ramón y Cajal. Ctra. Colmenar Viejo, km. 9.100. 28034 Madrid.
Email: amagur@yahoo.com

It may be assumed that health professionals have a healthier lifestyle than the rest of the population, yet this is not necessarily true: an investigation involving 7,288 American doctors concluded that alcohol abuse/dependence is an important problem among these workers (12.9% and 21.4% of male/female doctors respectively meet the criteria for alcohol abuse or dependence) (Oreskovich et al., 2015). In Germany, a survey of medical students and physicians showed that 24.8% of male physicians and 36.5% of male medical students reported alcohol ingestions greater than the daily doses recommended by the German Society of Nutrition regarding maximum alcohol intake (> 20 g/d). Among participating women, 25.3% of the physicians and 30.4% of the medical students reported having ingested more alcohol than recommended (> 10 g/d) (Voigt et al., 2009). A Brazilian sample of 510 doctors and nurses showed a lower prevalence of abstainers among these professionals, similar rates of alcohol abuse, and a higher prevalence of binge drinking episodes compared to the general Brazilian population (Tobias et al., 2019). In Spain, a recent survey among primary care professionals showed a higher prevalence of alcohol use in this group with respect to the general population, with a percentage of risky drinking according to the AUDIT-C criteria of 32% (Romero-Rodríguez et al., 2019a). The profile of a risky drinker in this sample was that of a male doctor, aged over 56 years and with a longer average professional career in years (Romero-Rodríguez et al., 2019b).

Little is known about the health behaviours and lifestyles that contribute to the abuse of alcohol and other drugs among health professionals. Different variables have been linked to an increased risk of alcohol and drug abuse among healthcare workers: personality traits such as alexithymia (Pedersen, Sørensen, Bruun, Christensen & Vedsted, 2016), coping styles (Grotmol et al., 2010), personal and professional factors, and being affected by burnout syndrome (Alexandrova-Karamanova et al., 2016). The abuse of drugs and alcohol has also been frequently considered a dysfunctional strategy of self-medication in the face of comorbidity with affective and anxiety disorders in the general population (Robinson, Sareen, Cox & Bolton, 2009; Turner, Mota, Bolton & Sareen, 2018). This could also be said for alcohol use as a means of controlling PTSD symptoms (Bensley et al., 2018).

The COVID-19 pandemic has established a series of environmental, social and intrapsychic conditions that may have promoted the inappropriate use of alcohol and other drugs as a resource for controlling psychological distress. An editorial in *The Lancet* noted the increase in direct and indirect markers of alcohol use in the general population during the pandemic, both in people with no prior risky drinking patterns and in individuals with alcohol use disorders (Clay & Parker, 2020). There is recent evidence showing a significant association between the specific psychological stress of COVID-19 and drinking behaviour, a relationship mediated by sex and by the socioeconomic consequences of the pandemic in the general American population (Rodriguez, Litt & Stewart, 2020; Wardell et al., 2020). There is growing concern that the global burden of disease related to alcohol use disorders, including the increasing incidence of alcohol-related liver diseases, may worsen during the pandemic (Da, Im & Schiano, 2020). The relationship between substance abuse and the COVID-19 pandemic has also been studied in other countries and settings (Neill et al., 2020). There are earlier reports on the relationship between the exposure of health care workers to pandemic outbreaks and the risk of developing an alcohol use disorder which show a link between having been in quarantine and working in places where exposure to patients of SARS was common and later symptoms of alcohol abuse/dependence, even three years after the SARS outbreak (Wu et al., 2008).

The aim of this study was to estimate whether hospital workers increased the consumption of alcohol and drugs of abuse during the first wave of COVID-19. In addition, it was intended to define which worker profile was the most vulnerable to this behaviour.

From mid-March 2020 to the end of April 2020, Spain suffered the first wave of the COVID-19 outbreak, which affected the city of Madrid in particular. The hospital in which the study was carried out (Hospital Universitario Ramón y Cajal), a large tertiary care centre, was one of the hardest hit by the pandemic, having to deal with far-reaching logistical and healthcare restructuring to meet demands generated by the peak of hospitalizations for pneumonia caused by SARS-CoV-2.

Method

For this cross-sectional study, a questionnaire was designed to be used in an online survey among all staff working at the Ramón y Cajal University Hospital during the first wave of COVID-19. The survey was distributed online by institutional email, and was also accessible on the hospital's intranet. Anonymous participation of all workers of different categories was encouraged for this voluntary study without financial incentives. The form was divided into four sections grouping different types of variables: sociodemographic data (sex, age, type of living arrangements) and health and professional status during the pandemic (professional category, experience, type of activity, personal mental health history, infection by SARS-CoV-2, COVID-19 symptoms); stress factors that workers linked to their work environment and activities during the pandemic; risk and protective behaviours outside the workplace during the pandemic; and the General Health Questionnaire scale (GHQ-12) (Goldberg & Hillier,

1979; Goldberg & Williams, 1988). This questionnaire is an instrument for detecting common mental disorders, as well as a general measure of psychological well-being which has been validated for use in the Spanish population (Sánchez-López & Dresch, 2008). Among the different risk behaviours, respondents were specifically questioned if they had increased their consumption of alcohol and/or drugs of abuse during the period of the first COVID-19 wave (mid-March to the end of April). The question "Has your use of alcohol or drugs of abuse increased during the pandemic?" asks whether these substances have been used as a possible way of coping with the stress generated by the pandemic situation.

The survey was conducted between June 15 and July 25, 2020 after being approved by the hospital's clinical research ethics committee. Informed consent of all individuals was required before participating.

After an initial, raw analysis of the results, some variables were recoded and grouped according to criteria that were considered clinically relevant in order to increase the strength of the analysis. Continuous variables were described using means and standard deviations (SD), categorical variables through absolute and relative frequency. For inferential statistics, Student's t-test was used on quantitative variables. The association between categorical variables was made using the chi-square test or Fisher's exact test. To study the link between the use of alcohol and/or drugs of abuse and the risk variables, the backward stepwise logistic regression model (Wald) was used, adjusting for the variables which, based on the literature, our raw results and biological plausibility were interpreted as potentially influencing the abuse of drugs and alcohol. This association is presented as an odds ratio (OR). The possibility of interacting and confounding factors was explored. All analyses were carried out with the Statistical Package for the Social Sciences (SPSS), version 19.

Results

The survey comprised 657 respondents (out of a total 6,119 health and non-health professionals of the stable workforce plus reinforcements hired to attend the first COVID wave). Of these, 79.1% were women, with an estimated mean age of 41.06 years (SD = 11.63). Respondents living with dependents made up 33.5%, while 51.4% lived alone or with a partner. Of those surveyed, 81.6% were healthcare workers, with 28.9% of them nurses and 17.0% nursing assistants, 13.5% resident doctors and 19.8% staff doctors. The distribution by professional category in the sample is similar to that of the total population of hospital workers during the pandemic. Average length of professional experience was 15.3 years (SD = 10.9). So-called "front line" workers, those working directly in the care of patients with COVID-19, made up 54.3%. Of those surveyed, 17.1% declared that they had increased the consumption of alcohol and/or drugs of abuse during the period of the pandemic covered by the study.

Significant differences were found in certain variables between those who increased their alcohol consumption or used drugs of abuse, and those who did not. It should be noted that those with increased alcohol/drug use during the COVID outbreak were significantly younger (p = .005) and had a higher total GHQ-12 score (p = .031), which is interpreted as a higher level of psychological stress or emotional impact (Table 1). The differences in the type of living arrangements were also significant (higher percentage of living without dependents among those with increased consumption, p = .001). Increased consumption of alcohol or drugs of abuse was more frequent among healthcare professionals (p = .022), those working on the COVID-19 front line (p = .009), and staff physicians and residents (p = .001) (Table 2). Significant differences were also observed between variables considered protective or risk factors: those who increased alcohol and/or drugs use

Table 1. ***Increased consumption of alcohol/drugs of abuse and sociodemographic variables.***

	Increased consumption of alcohol/drugs of abuse	n	Mean	SD	Sig.
Estimated mean age	No	542	41.65	11.83	**.005**
	Yes	112	38.25	10.85	
Mean years of professional experience	No	454	15.67	11.00	.071
	Yes	107	13.57	10.07	
GHQ-12 score	No	534	16.62	5.40	**.031**
	Yes	110	17.85	5.79	

Note. SD: standard deviation.
GHQ-12: Goldberg General Health Questionnaire, 12-item version.

Tabla 2. *Comparative analysis of independent variables vs increase in alcohol/drug abuse.*

		Increased consumption of alcohol/drugs of abuse				Chi squared	Sig.
		No		Yes			
		n	%	n	%		
Sex	Men	106	19.6%	30	27.0%	3.118	.095
	Women	436	80.4%	81	73.0%		
Type of living arrangements	No dependents	261	48.2%	74	66.1%	11.804	**.001**
	With dependents	280	51.8%	38	33.9%		
Health professional	Yes	433	79.9%	100	89.3%	5.435	**.022**
	No	109	20.1%	12	10.7%		
Close contact with COVID-19	Front line	273	50.4%	72	64.3%	7.213	**.009**
	Second line	269	49.6%	40	35.7%		
Staff physician and residents	Yes	166	30.6%	53	47.3%	11.614	**.001**
	No	376	69.4%	59	52.7%		
GHQ-12 positive screening	Yes	449	84.1%	93	84.5%	0.015	1.000
	No	85	15.9%	17	15.5%		

Note. GHQ-12: Goldberg General Health Questionnaire, 12-item version.

Table 3. *Comparative analysis of risk and protective factors vs increase in alcohol/drug abuse consumption.*

		Increased consumption of alcohol/drugs of abuse				Chi squared	Sig.
		No		Yes			
		n	%	n	%		
Presence of COVID-19 symptomatology	No	326	60.3%	60	53.6%	1.717	.206
	Yes	215	39.7%	52	46.4%		
Clinical diagnosis of COVID-19 infection	No	344	63.9%	76	69.1%	1.062	.326
	Yes	194	36.1%	34	30.9%		
Loss of a relative	No	420	78.1%	93	83.8%	1.816	.201
	Yes	118	21.9%	18	16.2%		
Regular physical activity	No	328	60.7%	75	67.0%	1.522	.240
	Yes	212	39.3%	37	33.0%		
Practice of relaxation techniques/meditation/ mindfulness	No	341	63.0%	69	61.6%	0.081	.830
	Yes	200	37.0%	43	38.4%		
Good sleep habits	Unsatisfactory	277	51.1%	62	55.4%	0.672	.467
	Satisfactory	265	48.9%	50	44.6%		
Nutritional habits	Unsatisfactory	206	38.1%	62	55.9%	12.025	**.001**
	Satisfactory	335	61.9%	49	44.1%		
Leisure activities	Unsatisfactory	368	68.3%	82	73.2%	1.060	.369
	Satisfactory	171	31.7%	30	26.8%		
Social interaction	Unsatisfactory	232	42.9%	47	42.0%	0.032	.917
	Satisfactory	309	57.1%	65	58.0%		
Exposure to information in media and social networks	Unsatisfactory	198	37.0%	51	45.5%	2.844	.109
	Satisfactory	337	63.0%	61	54.5%		
Personal history of mental illness	No	453	84.2%	92	82.1%	0.290	.575
	Yes	85	15.8%	20	17.9%		
Self-prescription of psychotropics	No	409	75.6%	64	57.1%	15.833	**.000**
	Yes	132	24.4%	48	42.9%		

Tabla 4. *Regression model.*

							95% CI EXP(B)	
	B	E.T.	Wald	df	Sig	Exp (B)	Lower	Higher
Sex	.544	.270	4.043	1	.044	1.723	1.014	2.927
Living arrangements	.659	.235	7.848	1	.005	1.934	1.219	3.067
Self-prescription of psychotropics	.733	.243	9.122	1	.003	2.081	1.293	3.348
Nutritional habits	.702	.242	8.433	1	.004	2.018	1.256	3.241
Staff physician and residents	.614	.240	6.567	1	.010	1.847	1.155	2.954
Close contact with COVID-19	.4.50	.237	3.608	1	.058	1.568	.986	2.493
Constant	-9.107	1.364	44.604	1	.000	.000		

Note. Variables introduced in the model: sex, estimated mean age, years of experience, health professional, presence of COVID-19 symptoms, loss of a relative, personal history of mental illness, type of living arrangements, close contact with COVID-19, self-prescription of psychotropic, nutritional habits, good sleep habits, leisure activities, social interaction, regular physical activity, staff physician and residents, GHQ-12 score.

had worse nutritional habits (p = .001) and also used self-prescribed psychotropic drugs more frequently (p = .000). There were no statistically significant differences regarding the presence of a personal history of mental illness (p = .575) (Tables 2 and 3).

In the logistic regression model (Table 4), the following significant findings stand out: being male was linked to a 1.723 times (95% CI: 1.014 to 2.927) higher risk of increased alcohol/illicit drug intake, other variables remaining constant. Also, living alone or with a partner (not having dependents) heightened the risk of increased alcohol/illicit drug use by 1.934 (95% CI: 1.014 to 2.927) compared to the risk of those living with people depending on them. With all values of other model variables remaining constant and self-prescribed psychotropic use present, the risk of increasing alcohol/drug abuse rose by 2.081 times (95% CI: 1.293 to 3.348) compared to the risk if the use of psychotropics was not self-prescribed. Being a staff doctor or a resident intern was also a factor to consider, increasing the risk of greater alcohol/drug use compared to the other professional categories by 1.847 (95% CI: 1.155 to 2.954). Similarly, COVID-19 frontline work increased the risk of using more alcohol/illicit drugs by 1.658 (95% CI: 0.986 to 2.493). Finally, those with bad nutritional habits had a 2.018 (95% CI: 1.256 to 3.241) higher risk of increasing alcohol/illicit drug use than those with good habits.

Discussion

A large percentage of the sample reported increasing their intake of alcohol and/or drugs of abuse during the first wave of COVID-19. Compared to those who did not, those increasing their use were younger, were more frequently members of the group of health professionals, with a greater representation of staff doctors and residents, worked more frequently on the front line of COVID-19 care, and more often lived alone or without dependents. They also had worse nutritional habits and reported higher stress as measured on the GHQ-12 scale. Psychotropic drugs were also more frequently self-prescribed to manage anxiety and insomnia. Those who increased substance use during the pandemic did not more frequently have a personal history in terms of monitored mental health.

There have been few studies to date of alcohol and drug abuse by healthcare workers during the COVID-19 outbreak (Conroy et al., 2021; Gomes et al., 2020; Silczuk, 2020). Previous research has highlighted a significant increase in alcohol use among physicians who were in lockdown (Silczuk, 2020) as well as among health workers, irrespective of working on site or from home (Conroy et al., 2021). This last study showed that 8% of the sample were cannabis users before lockdown and that there was a rise in the amount of this substance used during the COVID-19 pandemic (Conroy et al., 2021). The increase in alcohol use in other studies has been seen as a tangible manifestation of the global worsening of health habits among physicians, being related to weight gain and decreased physical and sexual activity (Gomes et al., 2020).

In our sample, younger professionals living without dependents were more susceptible to increasing their consumption of alcohol or drugs of abuse. Doctors and men were represented more strongly in this group, and their total scores on the GHQ-12 tended to be higher compared to the sample average.

Some previous reports have found that male medical students/resident doctors drink alcohol more regularly compared to other healthcare professionals (Lamberti et al., 2017). In our study, a higher GHQ-12 total score (p = .041) was found in those who increased alcohol and/or drugs of abuse consumption. Working on the front lines during the COVID-19 pandemic was also significantly associated with increased use of alcohol and illicit drugs. It can therefore be concluded that the use of alcohol or drugs of abuse may represent a dysfunctional coping strategy to manage anxiety/insomnia symptoms in a group of health workers with less experience and potentially greater vulnerability to stress who also lack the necessary coping tools. In the general population, self-medication for anxiety through the use of alcohol and drugs has also been reported more often in younger people and those who are divorced or never married (Robinson et al., 2009). Those who do not self-medicate are more frequently women (Robinson et al., 2009). In the context of the COVID-19 pandemic, general population-based research has found that parents with at least one child under the age of 18 were at increased risk of increased alcohol use (Wardell et al., 2020), which is contrary to our findings on the link between living without dependents and the increased risk of alcohol/drug abuse.

Our study has some limitations that should be noted. First, it is difficult to estimate the extent to which those who respond to the survey constitute a representative sample of hospital workers, although the ratios of professional categories in the sample are similar to those of the study population. Secondly, the variable measuring the increase in substance use presupposes that this is a strategy for coping with the stress generated by the pandemic situation. Given that the study is based exclusively on the generic self-report of the individuals, the lack of documentation regarding previous patterns of alcohol and/or drug use in the study subjects, and the absence of the use of standardized tools to estimate and quantify this use are also limitations. This could in turn condition the lack of correlation between use and previous history of mental illness. Similarly, asking respondents to recall events and data that occurred a few months earlier, and also in a situation of stress and great emotional impact, is likely to be subject to an information bias. There is also a greater probability that those who

suffered most from the psychological impact of the first wave responded to the questionnaire (selection bias). Finally, the type of study carried out does not permit causal associations to be established, highlighting relationships between variables instead.

The relevance of these findings on drug and alcohol use patterns in hospital workers during the Covid-19 outbreak highlights the need to monitor subjects who increased their alcohol use or took illicit drugs to cope with anxiety, and to adopt specific detection and therapeutic interventions to reduce the impact of substance abuse on hospital workers.

Conclusions

A significant percentage of hospital workers fighting COVID-19 during the first wave at the Ramón y Cajal University Hospital in Madrid increased their consumption of alcohol and/or drugs of abuse. Given the profile presented by this group of professionals (greater exposure to stress and absence of other coping strategies), the use of alcohol and drugs of abuse may be seen as a failed strategy for coping with the stress and anxiety produced by the pandemic in individuals who have less experience and may be more vulnerable to them. It is important to implement both screening tests and therapeutic interventions to promote a suitable approach to this important health problem in hospital workers.

Conflict of interests

The authors declare no conflict of interest in this study.

References

Alexandrova-Karamanova, A., Todorova, I., Montgomery, A., Panagopoulou, E., Costa, P., Baban, A.,… Mijakoski, D. (2016). Burnout and health behaviors in health professionals from seven European countries. *International Archives of Occupational and Environmental Health, 89*, 1059–1075. doi:10.1007/s00420-016-1143-5.

Bensley, K. M., Seelig, A. D., Armenta, R. F., Rivera, A. C., Peterson, A. V., Jacobson, I. G.,… Williams, E. C. (2018). Posttraumatic stress disorder symptom association with subsequent risky and problem drinking initiation. *Journal of Addiction Medicine, 12*, 353–362. doi:10.1097/ADM.0000000000000420.

Clay, J. M. & Parker, M. O. (2020). Alcohol use and misuse during the COVID-19 pandemic: A potential public health crisis? *Lancet Public Health, 5*. doi:10.1016/S2468-2667(20)30088-8.

Conroy, D. A., Hadler, N. L., Cho, E., Moreira, A., MacKenzie, C., Swanson, L. M.,… Goldstein, C. A. (2021). The effects of COVID-19 stay-at-home order on sleep, health, and working patterns: A survey study of US health care workers. *Journal of Clinical Sleep Medicine, 17*, 185-191. doi:10.5664/jcsm.8808.

Da, B. L., Im, G. Y. & Schiano, T. D. (2020). Coronavirus disease 2019 hangover: A rising tide of alcohol use disorder and alcohol-associated liver disease. *Hepatology, 72*, 1102–1108. doi:10.1002/hep.31307.

Goldberg, D. P. & Hillier, V. F. (1979). A scaled version of the general health questionnaire. *Psychological Medicine, 9*, 139–145. doi:10.1017/S0033291700021644.

Goldberg, D. P. & Williams, P. (1988). *A user's guide to the general health questionnaire*. Berks: Windsor: NFER-Nelson.

Gomes, C. M., Favorito, L. A., Henriques, J. V. T., Canalini, A. F., Anzolch, K. M. J., de Carvalho Fernandes, R.,… de Bessa, J. (2020). Impact of COVID-19 on clinical practice, income, health and lifestyle behavior of Brazilian urologists. *International Braz J Urol, 46*, 1042-1056. doi:10.1590/S1677-5538.IBJU.2020.99.15.

Grotmol, K. S., Vaglum, P., Ekeberg, Ø., Gude, T., Aasland, O. G. & Tyssen, R. (2010). Alcohol expectancy and hazardous drinking: A 6-year longitudinal and nationwide study of medical doctors. *European Addiction Research, 16*, 17–22. doi:10.1159/000253860.

Lamberti, M., Napolitano, F., Napolitano, P., Arnese, A., Crispino, V., Panariello, G. & di Giuseppe, G. (2017). Prevalence of alcohol use disorders among under- and post-graduate healthcare students in Italy. *PLoS ONE, 12*. doi:10.1371/journal.pone.0175719.

Neill, E., Meyer, D., Toh, W. L., van Rheenen, T. E., Phillipou, A., Tan, E. J. & Rossell, S. L. (2020). Alcohol use in Australia during the early days of the COVID-19 pandemic: Initial results from the COLLATE project. *Psychiatry and Clinical Neurosciences*, *74*, 542–549. doi:10.1111/pcn.13099.

Oreskovich, M. R., Shanafelt, T., Dyrbye, L. N., Tan, L., Sotile, W., Satele, D.,… Boone, S. (2015). The prevalence of substance use disorders in American physicians. *American Journal on Addictions, 24*, 30–38. doi:10.1111/ajad.12173.

Pedersen, A. F., Sørensen, J. K., Bruun, N. H., Christensen, B. & Vedsted, P. (2016). Risky alcohol use in Danish physicians: Associated with alexithymia and burnout? *Drug and Alcohol Dependence, 160*, 119–126. doi:10.1016/j.drugalcdep.2015.12.038.

Robinson, J., Sareen, J., Cox, B. J. & Bolton, J. (2009). Self-medication of anxiety disorders with alcohol and drugs: Results from a nationally representative sample. *Journal of Anxiety Disorders, 23*, 38–45. doi:10.1016/j.janxdis.2008.03.013.

Rodriguez, L. M., Litt, D. M. & Stewart, S. H. (2020). Drinking to cope with the pandemic: The unique associations of COVID-19-related perceived threat and psychological distress to drinking behaviors in American men and women. *Addictive Behaviors*, *110*. doi:10.1016/j.addbeh.2020.106532.

Romero-Rodríguez, E., Pérula De Torres, L. Á., Fernández García, J. Á., Parras Rejano, J. M., Roldán Villalobos, A. & Camarelles Guillén, F. (2019a). Alcohol consumption in Spanish primary health care providers: A national, cross-sectional study. *BMJ Open, 9*. doi:10.1136/bmjopen-2018-024211.

Romero-Rodríguez, E., Pérula De Torres, L. Á., Parras Rejano, J. M., Leiva-Cepas, F., Camarelles Guillem, F., Fernández Márquez, R.,… Pérula De Torres, C. (2019b). Prevalence of hazardous alcohol use among Spanish primary care providers. *BMC Family Practice, 20*. doi:10.1186/s12875-019-0999-3.

Sánchez-López, M. D. P. & Dresch, V. (2008). The 12-item general health questionnaire (GHQ-12): Reliability, external validity and factor structure in the Spanish population. *Psicothema, 20*, 839–843.

Silczuk, A. (2020). Threatening increase in alcohol consumption in physicians quarantined due to coronavirus outbreak in Poland: The ALCOVID survey. *Journal of Public Health, 42*, 461–465. doi:10.1093/pubmed/fdaa110.

Tobias, J. S. P., da Silva, D. L. F., Ferreira, P. A. M., da Silva, A. A. M., Ribeiro, R. S. & Ferreira, A. S. P. (2019). Alcohol use and associated factors among physicians and nurses in northeast Brazil. *Alcohol, 75*, 105–112. doi:10.1016/j.alcohol.2018.07.002.

Turner, S., Mota, N., Bolton, J. & Sareen, J. (2018). Self-medication with alcohol or drugs for mood and anxiety disorders: A narrative review of the epidemiological literature. *Depression and Anxiety*, *35*, 851–860. doi:10.1002/da.22771.

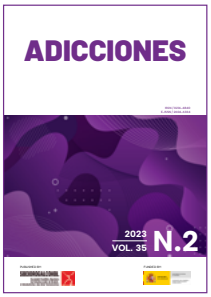
Voigt, K., Twork, S., Mittag, D., Göbel, A., Voigt, R., Klewer, J.,… Bergmann, A. (2009). Consumption of alcohol, cigarettes and illegal substances among physicians and medical students in Brandenburg and Saxony (Germany). *BMC Health Services Research*, *9*, 219. doi:10.1186/1472-6963-9-219.

Wardell, J. D., Kempe, T., Rapinda, K. K., Single, A., Bilevicius, E., Frohlich, J. R.,… Keough, M. T. (2020). Drinking to cope during COVID-19 pandemic: The role of external and internal factors in coping motive pathways to alcohol use, solitary drinking, and alcohol problems. *Alcoholism, Clinical and Experimental Research*, *44*, 2073–2083. doi:10.1111/acer.14425.

Wu, P., Liu, X., Fang, Y., Fan, B., Fuller, C. J., Guan, Z.,… Litvak, I. J. (2008). Alcohol abuse/dependence symptoms among hospital employees exposed to a SARS outbreak. *Alcohol and Alcoholism, 43*, 706–712. doi:10.1093/alcalc/agn073.

SOCIDROGALCOHOL
Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y las otras Toxicomanías

ADICCIONES
2023 ■ VOL. 35 ■ N. 2 ■ PAGES 151–164
www.adicciones.es



ORIGINAL

Personality traits and psychopathology in adolescents with videogame addiction

Rasgos de personalidad y psicopatología en adolescentes con adicción a videojuegos

Marta Sánchez-Llorens*,**, María Isabel Marí-Sanmillán**, Ana Benito**,***, Francesc Rodríguez-Ruiz*,**, Francisca Castellano-García**, Isabel Almodóvar*,**, Gonzalo Haro*,**.

* Department of Psychiatry, Consorcio Hospitalario Provincial de Castellón, Castellón, Spain.

** Research Team TXP, Department of Medicine, Universidad Cardenal Herrera-CEU, Castellón, Spain.

*** Torrente Mental Health Unit, Torrente, Valencia, Spain.

Abstract

Gaming disorder (GD) was recently included in the 11th edition of the International Classification of Diseases. A cross-sectional study was conducted in five secondary schools, with a final sample of 119 students. A diagnosis of GD was made in 6.4% (n = 23) of this sample. Compared with healthy subjects, adolescents with GD showed low levels of conscientiousness (F = 7.82; p = .001) and agreeableness (F = 3.31; p = .041) and scored higher in school maladjustment (SMC; F = 9.23; p < .001). Two discriminating functions were obtained that allowed us to predict patient group allocation with a success rate of 60.5% (Z_1 = 0.406 × Sex + 0.560 × Conscientiousness − 0.677 × SMC; Z_2 = 0.915 × Sex + 0.191 × Conscientiousness + 0.326 × SMC). Subjects with addiction differed from healthy subjects in presenting school maladjustment and low consciousness, while both groups of subjects with addiction differed in that video game addiction was proportionally higher in boys. The probability of GD was higher if subjects were male (OR [95% CI]) = 4.82 [1.17-19.81]; p = .029) and had school maladjustment (OR [95% CI] = 1.08 [1-1.17]; p = .047); while that of substance use disorder was higher if the subjects had neuroticism (OR [95% CI] = 1.07 [1-1.14]; p < .040), clinical maladjustment (OR [95% CI] = 1.10 [1.01-1.20]; p = .020), school maladjustment (OR [95% CI] = 1.06 [1-1.13]; p = .048), low personal adjustment (OR [95% CI] = 0.94 [0.88-0.99]; p = .047) and emotional symptoms (OR [95% CI] = 0.86 [0.78-0.96]; p = .006).

Key words: Internet gaming disorder (IGD), gaming disorder (GD), substance use disorder, personality, conscientiousness

Resumen

El trastorno por uso de videojuegos se incluyó recientemente en la 11ª edición de la Clasificación Internacional de Enfermedades. Se realizó un estudio transversal en cinco institutos, con una muestra final de 119 alumnos. El 6,4% (n = 23) de los sujetos tenía trastorno por uso de videojuegos. Los adolescentes con trastorno por uso de videojuegos mostraron bajos niveles de consciencia (F = 7,82; p = ,001) y amabilidad (F = 3,31; p = ,041); y puntuaron más alto en inadaptación escolar (SMC; F = 9,230; p < ,001) que los sanos. Obtuvimos dos funciones discriminantes que clasificaban correctamente al 60,5% (Z1 = 0,406 × Sexo + 0,560 × Conciencia - 0,677 × SMC; Z2 = 0,915 × Sexo + 0,191 × Conciencia + 0,326 × SMC). Los sujetos con adicción se diferenciaban de los sanos en presentar inadaptación escolar y baja conciencia, mientras que ambos grupos con adicción se diferenciaban en que los alumnos con adicción a videojuegos eran en mayor proporción varones. La probabilidad de trastorno por uso de videojuegos aumentaba si el sujeto era varón (OR [CI 95%] = 4,82 (1,17-19,81); p = ,029) con inadaptación escolar (OR [IC 95%] = 1,08 (1-1,17); p = ,047); mientras que el trastorno por uso de sustancias aumentaba si el sujeto presentaba neuroticismo (OR [IC 95%] =1,07 [1-1,14]; p < ,040), desajuste clínico (OR [IC 95%] = 1,10 [1,01-1,20]; p = ,020), inadaptación escolar (OR [IC 95%] = 1,06 [1-1,13]; p = ,048), bajo ajuste personal (OR [IC 95%] = 0,94 [0,88-0,99]; p = ,047) y síntomas emocionales (OR [IC 95%] = 0,86 [0,78-0,96]; p = ,006).

Palabras clave: trastorno por uso de videojuegos predominantemente en línea, trastorno por uso de videojuegos, trastorno por uso de sustancias, personalidad, consciencia

■ *Received: October 2020; Accepted: July 2021.*

■ ISSN: 0214-4840 / E-ISSN: 2604-6334

■ **Send correspondence to:**
Gonzalo Haro. Department of Medicine, Universidad Cardenal Herrera-CEU, Calle Grecia 31, Castellón, 12002, Spain.
Email: gonzalo.haro@uchceu.es

Video games use is an increasingly present behaviour in our society; it is the primary audiovisual leisure option in Spain both in domestic settings through consoles (26%) or PCs (21%) and via mobile phones or devices (21%). Indeed, playing videogames has become one of the most valued entertainment options for approximately 2.34 billion people (*Asociación Española de Videojuegos* –AEVI–, 2017; Statista, 2020). In 2018, there was a 6.2% increase in videogame players, with 59% being male and 41% female. Regarding the frequency of play, 77.4% played every week, and Spanish youth spend an average of 6.2 hours/week playing videogames, with the majority being adolescents or pre-adolescents (AEVI, 2017).

This increase has meant that criteria for detecting video game addiction have also been established. Following the inclusion of Internet Gaming Disorder (IGD) as a condition for further study in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association –APA–, 2013), Gaming Disorder (GD) was recently included as a formal diagnosis in the 11th edition of the International Classification of Diseases (ICD-11) (World Health Organization –WHO–, 2018). The ICD refers to both offline and online games and draws a distinction between GD and hazardous gaming (Throuvala, Janikian, Griffiths, Rennoldson & Kuss, 2019). The ICD-11 criteria include (1) impaired control over gaming (e.g., onset, frequency, intensity, duration, termination, and context); (2) increasing priority given to gaming to the extent that gaming takes precedence over other life interests and daily activities; and (3) continuation or escalation of gaming despite the occurrence of negative consequences. The behaviour pattern required for a GD diagnosis must be sufficiently severe to result in significant impairment to personal, family, social, educational, occupational, or other important areas of function (WHO, 2018). Since IGD is not a formal diagnosis, here we will refer indistinctly to IGD and GD in reference to gaming addiction.

The aetiology of IGD is not well understood, perhaps because it is currently impossible to clearly demarcate pathological from non-pathological behaviours (Costa & Kuss, 2019). The development of problematic gaming behaviour is complex because, unlike substance addictions, gaming has some benefits, including spatial skill improvements, and enhanced creativity and problem-solving skills (Chung, Sum & Chan, 2018; Granic, Lobel & Engels, 2014). Although the risk factors for problematic videogaming have been difficult to establish, male sex, psychopathological conditions, impulsivity, gaming time and certain online gaming subtypes are deemed possible candidates (Buiza-Aguado, Alonso-Canovas, Conde-Mateos, Buiza-Navarrete & Gentile, 2018; Gentile et al., 2017). Several studies indicate that sex seems to be a robust predictor of IGD because males are more likely to engage in video game use and to be categorised as problematic gamers than females (Bouna-Pyrrou et al., 2018; Dong et al., 2018; Krossbakken et al., 2018). In fact, gendered motivations for higher levels of game play have been identified, suggesting different interventions for boys and girls may be required to create a balanced approach to video gaming (Brooks, Chester, Smeeton & Spencer, 2016).

The influence of age on IGD is also unclear, but the prevalence is highest among adolescents (Paulus, Ohmann, Von Gontard & Popow, 2018). Even though adolescents seem to be more vulnerable to IGD (Fam, 2018), the prevalence estimates reported for this population widely varies from 0.7% to 15.6%, depending on the measurement method, age, and geographical area considered. One recent study estimated the prevalence of IGD at 1%–10% in western countries (Chung et al., 2018; Saunders et al., 2017) and the prevalence of IGD in a sample of 708 Spanish adolescents was reported as 8.3% (Buiza-Aguado et al., 2018), with others finding similar rates at around 6.1% (Chamarro et al., 2014) and 8.2% (Porter, Starcevic, Berle & Fenech, 2010).

The Interaction of Person-Affect-Cognition-Execution (I-PACE) and Compensatory Internet Use (CIU) are two of the most influential models in gaming studies. The I-PACE (Brand, Young, Laier, Wölfling & Potenza, 2016) provides an integrative theoretical framework concerning internet-related disorders and posits that the core characteristics of individuals, including personality, biopsychological constitution, social cognitions, and psychopathology, constitute the aetiological factors involved in the development, maintenance, and relapse of IGD (Kircaburun, Griffiths & Billieux, 2019). Similarly, Paulus et al. (2018) suggested that developing IGD requires several interacting internal factors such as deficient self, mood, and reward regulation, decision-making problems, and external factors including deficient family background and social skills. The CIU model proposes that addictive internet use can compensate unmet needs (e.g., achievement, social affiliation, etc.) or help cope with psychological suffering in, for example, depressive, anxious, and traumatised individuals (Kircaburun et al., 2019). Both models also hypothesise personality characteristics are predisposing factors, with the I-PACE suggesting that interactions between potentially predisposing personality factors, use expectancies, and dysfunctional coping styles could be one of several important processes that facilitate the development of GD (Laier, Wegmann & Brand, 2018).

Concerning the Big Five model of personality traits, authors agree that neuroticism is positively associated with IGD and there is a negative association between GD and extraversion and conscientiousness (Borzikowsky & Bernhardt, 2018; Bouna-Pyrrou et al., 2018; Laier et al., 2018). The few studies that have explored the association

of the Big Five traits and GD in adolescents, consistently associate low conscientiousness with IGD. However, and with regard to other dimensions (extraversion, neuroticism, agreeableness, openness), the results are less conclusive (López-Fernández, Mezquita, Griffiths, Ortet & Ibáñez, 2020). Other personality traits have been related with IGD, especially impulsivity (Bouna-Pyrrou et al., 2018), lower self-control/self-regulation, sensation seeking, lower social competence and empathy (Estévez, Jauregui & López-González, 2019), lower responsibility (González-Bueso et al., 2018a), inclination towards boredom, risky behaviour (Paulus et al., 2018), and hostility and enhanced levels of aggression (Estévez et al., 2019; Kuss, 2013; Paulus et al., 2018). IGD has also been related with low self-esteem, alexithymia, emotional regulation dysfunctions (Bonnaire & Baptista, 2019), and psychoticism (González-Bueso et al., 2018a). In contrast, perseverance/grit (Borzikowsky et al., 2018), psychological resilience (Canale et al., 2019), positive reappraisal (Kökönyei et al., 2019), responsibility, reward dependence, complacency, and self-directedness (Brand et al., 2016; González-Bueso et al., 2018a), may also be protective factors according to different studies.

GD is thought to be a progressive behaviour with a chronic course that may lead to significant social, physical, and mental health problems. Although some studies have shown the positive impact of moderate videogames use, some individuals use gaming in a dysfunctional way and this behaviour becomes disruptive, thus potentially meeting the criteria for addiction (Throuvala et al., 2019). Decades of research have shown that some adolescents who engage in persistent gaming can experience mild to serious negative effects on their psychological wellbeing (King & Potenza, 2019) at the cognitive, psychological, and emotional levels (Throuvala et al., 2019). Lehenbauer-Baum et al. (2015) reported higher levels of psychopathology in addictive gamers than in healthy controls. In addition, people diagnosed with GD tend to experience depression, anxiety, social anxiety, and hostility (Király et al., 2015), with depression being the most common symptom. Indeed, addicts scored higher on the Beck Depression Inventory and Social Phobia Inventory and were less agreeable, thorough, or emotionally stable, with the intensity of anger, guilt, anxiety, and envy felt by addicted players being more severe than controls (Naskar, Victor, Nath & Sengupta, 2016).

While GD is common in attention-deficit hyperactive disorder (ADHD) (Bhat, Prakash & Srivastava, 2019), the connection between ADHD and videogames is inconclusive, with some authors finding no association between gaming and ADHD (Lobel, Engels, Stone, Burk & Granic, 2017). Regarding its social impact, some reported side effects are social isolation, cessation of hobbies or external activities, family conflicts, and difficulties in interpersonal relationships (Chung et al., 2018). There is increased public awareness that GD is a severe disorder with negative consequences such as failing school and family and relationship problems (Borzikowsky et al., 2018), and many authors agree that there is a strong association between problematic gaming and poor academic performance (Chung et al., 2018; Lobel et al., 2017; Naskar et al., 2016). Only a study showed an indirect association between strategic video game play and higher academic grades, opening to the possibility that certain subtypes of videogames could have a positive impact on academic performance (Adachi & Willoughby, 2013).

Compared to other addictions, GD shows identical neural mechanisms to substance use disorders (SUDs) and many other behavioural addictions such as pathological gambling (Bhat et al., 2019). Although these are two different types of addictions, they frequently coexist because they both involve the same or similar biological mechanisms (Kuss, Pontes & Griffiths, 2018). In addition, problematic videogaming shares a common psychopathological basis with other addictions, including attention bias, low inhibitory control, and impulsivity, and psychopathological features such as depression, low self-esteem, and isolation (Buiza-Aguado et al., 2018). Symptoms in patients with GD resemble addiction-specific phenomena comparable with those seen in SUDs, including cravings and withdrawal symptoms such as unpleasant feeling and tolerance states (Kim et al., 2017). Moreover, like other addictive behaviours, GD has been associated with many dysfunctional personality traits. In fact, neuroticism might represent a general health risk factor which predisposes individuals to addiction; higher neuroticism scores are connected with GD and with the tendency to feel anxious, depressed, and guilty (Bouna-Pyrrou et al., 2018).

Although there is no consensus regarding all the personality traits involved in GD, several studies have analysed the weight of personality in the development of GD, as well as its relationship with SUDs or other factors such as interpersonal relationships, family dynamics, or emotional regulation strategies. However, very few empirical studies have examined the relationship between personality and psychopathology in GD and the involvement of these variables in GD and SUDs has never been clearly established. In this study we aimed to (1) identify the personality traits involved in the development of GD in an adolescent population; (2) understand the difference between the personality traits of adolescents with SUD and GD; (3) clarify the relationship between GD, psychopathology, and academic performance; and (4) establish the scientific basis for developing addiction prevention programs for certain personality types in the adolescent population.

We suggest the following empirical hypotheses: (1) Certain personality traits predispose to addictive behaviours in general, being low conscientiousness a risk

factor for developing GD; (2) Psychopathology such as anxiety, depression and social anxiety is found in subjects with GD; (3) GD is related to school maladjustment and poor academic performance.

Method

Design

This was an observational, cross-sectional study with descriptive and analytical components.

Participants

The initial sample comprised 397 students in the third or fourth year of compulsory secondary education, from four private or concerted schools, or one public secondary school in the province of Castellón. These educational centres were selected by intentional sampling, according to availability and geographical location. We used G*Power software (version 3.1) to calculate that a minimum sample size of N = 111 would be required to perform an ANOVA with three groups, a 95% confidence level at a power of 80% and with a 0.30 effect size.

We selected the participants with a video game addiction (score exceeding the CERV and GASA cutoff; n = 23) or with a substance addiction (above the threshold in at least two of the CRAFFT, POSIT, and AUDIT questionnaires; n = 37). Any participants who scored above the cut-off in only one of the substance or video games questionnaires were excluded because, although they could not be considered healthy, a single questionnaire is insufficient for an adequate diagnosis. We also excluded those with addictions to both substances and video games. Of the remaining healthy participants (who scored below the cut-off on all the questionnaires), 59 were randomly selected in order to obtain a final sample of 119 students. A flowchart of sampling can be seen in figure 1.

Measurement instruments

The Questionnaire of Experiences Associated with Video games (CERV) scale assesses the problematic use of non-massive video games. It comprises 17 items on concern, denial, increased tolerance, negative effects, reduced activities, loss of control, evasion, and desire to play. The cut-off was ≥ 26, considering scores between 26 and 38 a potential problem and scores between 39 and 68 a severe problem. The Cronbach's alpha coefficients for the subscales are: 0.869 for negative consequences and 0.861 for dependence and evasion, with the total Cronbach's alpha of 0.912 (Chamarro et al., 2014). Cronbach's alpha in the sample was 0.95.

The Game Addiction Scale for Adolescents (GASA), assesses video game addiction and consists of 7 items corresponding to 7 dimensions (salience, tolerance, emotion, relapse, abstinence, conflict, and problems), which are grouped into a higher order factor: addiction. The items are scored dichotomously and the positive items are then summed; the cut-off was ≥ 4. The reliability of the Spanish adaptation is Cronbach's alpha of 0.81 (Lloret, Morell, Marzo & Tirado, 2018), a value that exceeds the criterion of 0.70 and is consistent with those published by the original authors (Lemmens, Valkenburg & Peter, 2009), who obtain high reliability, both on the 21-item scale (first sample, a Cronbach's alpha of 0.94 and, second sample, a Cronbach's alpha of 0.92), and on the 7-item scale (first sample, a Cronbach's alpha of 0.86 and, second sample, a Cronbach's alpha of 0.81) (Lloret et al., 2018). Cronbach's alpha in the sample was 0.92.

Abuse Screening Test (CRAFFT), is a tool designed for use with adolescents to screen the risky consumption of alcohol and other substances; it comprises 6 dichotomous items (yes/no) and the cut-off was ≥ 2 positive items. The level of internal consistency obtained in the Spanish psychometric validation was 0.74, a level similar to that obtained in the original validation study by Knight, Sherritt, Shrier, Harris & Chang (2002), where an internal consistency of 0.72 was obtained. In the mentioned study, the sensitivity was 92% and the specificity was 82%, having obtained in the Spanish version a sensitivity of 74.4% and a specificity of 96.4% (Rial et al., 2019). Cronbach's alpha in the sample was 0.91.

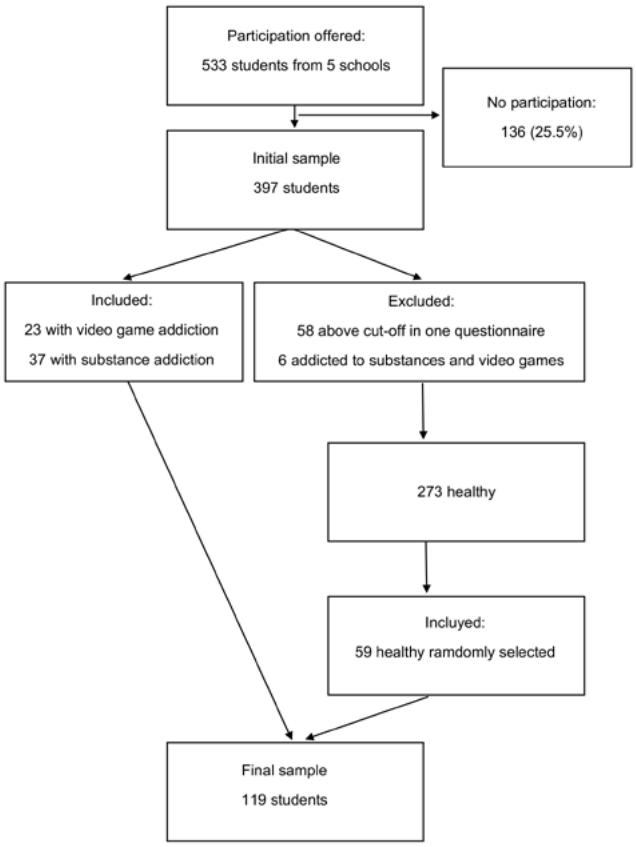


Figure 1. **Flowchart of the sampling.**

The Problem Oriented Screening Instrument for Teenagers (POSIT), is a common, internationally used instrument for screening for the risky consumption of alcohol and other drugs in adolescents and also consists of 17 dichotomous items (yes/no) and has a cut-off of ≥ 2 positive items. This instrument shows good psychometric behaviour in the Spanish version, showing high internal consistency (Cronbach's alpha 0.82) and high sensitivity (94.3%) and specificity (83.9%) values (Araujo, Golpe, Braña, Varela & Rial, 2018). In relation to the data found in other studies, the internal consistency of the scales measured by Cronbach's alpha varied in the test tests from 0.40 to 0.79 and in the retest from 0.45 to 0.87 (Knight, Goodman, Pulerwitz & Durant, 2001). Regarding the sensitivity and specificity indices, the data provided indicate values of 95% and 79%, respectively (Latimer, Winters & Stinchfield, 1997). Cronbach's alpha in the sample was 0.84.

Finally, the Alcohol Use Disorders Identification Test (AUDIT), is a screening test developed in collaboration with the World Health Organization that is used to determine excessive alcohol consumption; it comprises 10 questions and is scored out of a total of 40 points; total scores ≥ 8 in men and ≥ 6 in women indicate risky and harmful consumption as well as possible alcohol dependence (Babor, Higgings-Biddle, Saunders & Monteiro, 2000). The internal consistency would be between 0.75 and 0.94. The internal consistency indices are generally at 0.80 (Allen, Litten, Fertig & Babor, 1997). It has a sensitivity of 57-59% and a specificity of 91-96% (Álvarez, Gallego, Latorre & Bermejo, 2001). Cronbach's alpha in the sample was 0.84.

The "Big Five" personality questionnaire for children and adolescents (BFQ-NA), is an adaptation of the Big Five personality model (Barbaranelli et al., 2013); it consists of 65 items and the five dimensions evaluated are (a) Conscientiousness: autonomy, order, precision, perseverance, and compliance with regulations and commitments; (b) Openness: including elements of some intellectual factors, creativity, and cultural interests; (c) Extraversion: sociability, activity, enthusiasm, assertiveness, and self-confidence; (d) Agreeableness: the tendency to provide support and to be pro-social, as well as the degree of cooperation and sensitivity towards others and their needs; and (e) Neuroticism: the tendency towards being neurotic and ill at ease, manifested as mood swings, anxiety, depression, discontent, and irritability. Cronbach's alpha in its original version varies between 0.74 and 0.90 for each of the factors (Caprara & Zimbardo, 1996). Del Barrio, Carrasco & Holgado-Tello (2006), obtained adequate reliability (Cronbach's alpha between 0.78 and 0.88; test-retest between 0.62 and 0.84). The consistency by subscales was: alpha consciousness of 0.87, agreeableness 0.82, emotional instability 0.83, extraversion 0.76, openness 0.75 and, finally, internal consistency for the total of the scale 0.86 (Soto et al., 2011). Cronbach's alpha in the sample was 0.60.

The Behaviour Assessment System for Children (BASC), questionnaire is another system for assessing behaviour in children and adolescents (Reynolds & Kamphaus, 2004) which contains five components that can be used together or individually: here we used the self-report (S3) and a questionnaire for parents (P3). The internal consistency of the global dimensions varies from 0.76 to 0.96, with an average value of 0.91 (Reynolds & Kamphaus, 2004). Cronbach's alpha in the sample for S3 was 0.69 and for P3 0.84. The BASC is multidimensional because it measures numerous aspects of behaviour and personality, including both adaptive and maladaptive (pathological) dimensions. The S3 provides data from clinical scales and four global dimensions: School Maladjustment (SMC), Clinical Maladjustment (CMC), Personal Adjustment (PAC), and the Emotional Symptoms Index (ESI). SMC measures the attitude towards school and teachers as well as sensation seeking; high scores are related to psychopathology, risk of truancy, and tendency to engage in new or risky behaviours. CMC measures atypicality, locus of control, anxiety, and somatisation; high scores are associated with emotional distress, feelings of helplessness or a lack of motivation, anxiety, and even psychotic symptoms. PAC measures the Relations with Parents, Interpersonal Relations, Self-Esteem, and Self-Reliance scales. The ESI is a self-reported global indicator of serious emotional disturbance, particularly internalised disorders; it composes four scales from the Internalising Problems composite (Social Stress, Anxiety, Depression, and Sense of Inadequacy) and two scales from the PAC (Self-Esteem and Self-Reliance). The P3 assessment questionnaires measure maladaptive behaviours. Finally, as a global dimension, the BASC allowed us to calculate four values: Externalising problems, Internalising problems, Adaptive skills, and an Index of behavioural symptoms.

Procedure

In order to access the sample of interest, we contacted the management teams at the five educational centres and explained with a personal appointment the purpose of the study to them. A letter was then sent to all the parents of the students in third or fourth year of compulsory secondary education at these centres requesting their authorisation for the participation of their children in this study. The tests were administered to the students by two independent psychologists from our educational team from October to December 2018 over two consecutive days for one and a half hours during class sessions specifically planned for this purpose. The participants' parents received their questionnaires by postal mail and returned the completed surveys back to us via their respective schools. Neither the families nor the adolescents received any kind of retribution for their collaboration.

Statistical analysis

We used SPSS software (v21, IBM Corp., Armonk, NY) to analyse the relationships between the variables studied. We compared sociodemographic characteristics between included and not included subjects using t test for quantitative variables and chi squared for categorical variables. Results were considered significant when $p < .05$. We compared the studied groups using chi squared tests for categorical variables. We calculated the correlations between the personality and psychopathological variables and the addiction screening scales. Because some quantitative variables were correlated, we performed multivariate analysis of variance (MANOVA) using as independent variable the diagnostic group (substance addiction, video game addiction or healthy) and as dependent variables age, repeated courses, BFQ's Conscientiousness, Openness, Extraversion, Agreeableness, and Neuroticism; and BASC's Clinical Maladjustment, School Maladjustment, Personal Adjustment, Total Emotional Symptoms Index, Exteriorising Problems, Interiorising Problems, Adaptative Skills, and Total Behavioural Symptoms Index. We used the Bonferroni correction. We specified these differences using one-way ANOVA and as post-hoc tests Tukey when the variances were homogeneous and Games-Howell when they were not. The effect size (ES) as the partial eta squared and the observed power (1-β) were calculated. Using the variables in which significant differences were found in ANOVA and chi squared, by discriminant analysis, we obtained two equations that allowed us to predict the participant categorisations. Finally, using the variables in which significant differences were found in the ANOVA and chi squared, we employed logistic multinomial regression to obtain variables that would allow us to predict group categorisation. Each variable was controlled by all the others included in the analysis.

Ethical aspects

The principles of the Declaration of Helsinki and the Convention of the Council of Europe (World Medical Association, 2013) were always met. The confidentiality of the participants and their data was guaranteed according to the General Data Protection Regulation (GDPR) law of May 2016 (European Parliament and Council, 2016). The students and guardians included in this study signed their informed consent prior to participation. The overall study protocol was authorised by the Ministry of Education, Research, Culture, and Sport (CN00A/2018/25/S), the ethics committee at the Cardenal Herrera-CEU University (CEI18/112), and by the Research commission of the Castellón Provincial Hospital (3-16/12/19).

Results

In the initial sample (N = 397), 46.9% (n = 168) were healthy, 9.3% (n = 37) had a substance addiction, 6.4% (n = 23) had a video game addiction, 34.6% (n = 124) scored above the cut off for at least one addiction questionnaire, and 1.6% (n = 6) had an addiction both to substances and video games. In the final sample (n = 119), 49.6% (n = 59) were healthy, 31.1% (n = 37) had a substance addiction, and 19.3% (n = 23) had a video game addiction. Table 1 shows the comparison between the subjects included and not in the final sample. There are not differences in age, sex, and repeated courses, but the subjects included lived in greater proportion only with father or mother and less with both.

Table 1. ***Sociodemographic characteristics and comparisons between subjects included (n = 119) and not included (n = 278) in the study.***

VARIABLE		INCLUDED (N = 119) $\bar{X}$/N SE/%	NOT INCLUDED (N = 278) $\bar{X}$/N SE/%	t/χ^2 p
AGE		14.85 0.79	14.80 0.71	.624 .533
SEX	Men	48 40.3	122 44	.467 .494
	Women	71 59.7	155 56	
COEXISTENCE**	Both Parents	68 65.4	202 82.4	12.167 .002
	Only father or mother	33 31.7	39 15.9	
	Other relatives	3 2.9	4 1.6	
REPEATED COURSES		0.33 0.62	0.22 0.53	1.485 .139

Note. **$p < .001$.

Table 2 shows the correlations between the personality and psychopathological variables and the addiction screening scales in the final sample. MANOVA reported that there were differences between the groups in the variables studied (F = 1.907; p = .007; ES: 0.287; $(1-\beta)$ = 0.995). Table 3 shows the mean scores of the final sample as well as the scores separated by groups and the comparations between groups by ANOVA. With respect to substance abuse group, healthy subjects scored higher in Conscientiousness (p = .005), and Openness (p = .015); and scored less in Neuroticism (p = .006), Clinical Maladjustment (p = .008), and School Maladjustment ($p <$ .001). With respect to video game addiction group, healthy subjects scored higher in Conscientiousness (p = .005), and Agreeableness (p = .045); and scored less in School Maladjustment (p = .027). Post-hoc tests did not reach significance in Personal Adjustment and Total Emotional Symptoms Index. No significant differences were identified between the video game and substance addiction groups. By chi squared, there were more boys than girls in the

Table 2. *Correlations between the personality and psychopathological variables and the addiction screening scales.*

	CRAFFT r *p*	POSIT r *p*	AUDIT r *p*	CERV r *p*	GASA r *p*
CONSCIENTIOUSNESS	-0.211 0.022*	-0.263 0.004**	-0.158 0.187	-0.165 0.073	-0.154 0.098
OPENNESS	-0.084 0.366	-0.174 0.059	-0.129 0.285	-0.046 0.616	-0.072 0.441
EXTRAVERSION	0.001 0.990	-0.050 0.592	0.065 0.591	-0.059 0.526	-0.049 0.598
AGREEABLENESS	-0.107 0.247	-0.146 0.112	-0.061 0.612	-0.224 0.014*	-0.222 0.017*
NEUROTICISM	0.125 0.176	0.407 <0.001**	0.349 0.003**	0.083 0.367	0.076 0.420
CLINICAL MALADJUSTMENT	0.209 0.023*	0.471 <0.001**	0.446 <0.001**	0.099 0.287	0.098 0.299
SCHOOL MALADJUSTMENT	0.172 0.063	0.344 <0.001**	0.317 0.007**	0.159 0.086	0.173 0.065
PERSONAL ADJUSTMENT	-0.123 0.185	-0.169 0.068	-0.238 0.047*	-0.183 0.048*	-0.127 0.175
TOTAL EMOTIONAL SYMPTOMS INDEX	0.068 0.462	0.177 0.055	0.206 0.088	0.320 <0.001**	0.300 0.001**
EXTERIORISING PROBLEMS	0.163 0.103	0.156 0.120	0.309 0.018*	0.067 0.508	0.067 0.509
INTERIORISING PROBLEMS	0.068 0.498	0.185 0.063	0.154 0.243	-0.095 0.345	-0.061 0.546
ADAPTIVE SKILLS	-0.100 0.321	-0.146 0.144	-0.142 0.287	-0.057 0.574	-0.020 0.844
TOTAL BEHAVIOURAL SYMPTOMS INDEX	0.046 0.647	0.178 0.074	0.149 0.265	0.030 0.768	0.031 0.765

Note. *p < .01 *p < .05.

Table 3. *Average scores (n = 119) and comparisons between the groups.*

VARIABLE	OS	H	SA	VGA	F *p*	ES 1-β
AGE	14.85 0.79	14.88 0.87	15 0.66	14.56 0.72	0.830 0.440	0.019 0.188
REPEATED COURSES	0.33 0.62	0.42 0.10	0.31 0.09	0.13 0.09	1.438 0.243	0.033 0.300
CONSCIENTIOUSNESS**	52.07 1.69	56.23 1.51	48 8.90	47.95 1.01	7.826 0.001	0.157 0.945
OPENNESS*	53.90 1.31	56.67 1.76	5.32 8.19	52.56 1.55	4.283 0.017	0.093 0.732
EXTRAVERSiON	48.74 11.22	5.16 1.86	48 11.17	46.30 12.16	0.787 0.459	0.018 0.180
AGREEABLENESS*	5.29 9.96	52.91 1.51	49.05 8.83	45.56 8.31	3.316 0.041	0.073 0.614
NEUROTICISM**	53.72 11.98	49.15 1.70	6.32 1.79	54.82 12.09	5.049 0.008	0.107 0.805
CLINICAL MALADJUSTMENT**	52.14 11.41	47.72 9.23	58.10 12.01	53.69 11.01	4.989 0.009	0.106 0.800
SCHOOL MALADJUSTMENT**	51.47 11.29	46.55 9.76	57.21 1.80	54.65 1.49	9.230 <0.001	0.180 0.973
PERSONAL ADJUSTMENT*	45.20 12.75	49.01 11.63	41.40 12.32	41.69 13.77	3.340 0.040	0.074 0.617
TOTAL EMOTIONAL SYMPTOMS INDEX*	53.93 12.45	49.84 9.63	56.35 11.79	6.34 16.12	4.087 0.020	0.089 0.711
EXTERIORISING PROBLEMS	47.51 1.63	45.29 8.25	51 13.03	48.55 11.64	2.017 0.139	0.046 0.406
INTERIORISING PROBLEMS	48.59 12.03	47.42 8.41	52.27 14.13	46.31 16.17	1.259 0.289	0.029 0.267
ADAPTIVE SKILLS	52.20 1.84	53.74 9.74	5.03 12.61	51.11 1.81	1.023 0.364	0.024 0.223
TOTAL BEHAVIOURAL SYMPTOMS INDEX	47.56 11.82	45.61 1.77	5.48 13.18	48.72 12.09	1.078 0.345	0.025 0.233

Note. OS: Overall sample (N=119), H: Healthy, SA: Substance addiction, VGA: Video game addiction, ES: Effect size by partial Eta Squared, *p < .005, **p < .001.

group with an addiction to video games (χ^2= 7.87; p = .020). There were no differences in coexistence (χ^2= 5.816; p = .213).

We created two functions that could predict the group assignment of these students with an overall 60.5% success rate (healthy 81.4%, substance addiction 40.5%, and video game addiction 39.1%). These equations are:

Z1 = 0.406 x Sex + 0.560 x Conscientiousness - 0.677 x SMC

Z2 =0.915 x Sex + 0.191 x Conscientiousness + 0.326 x SMC

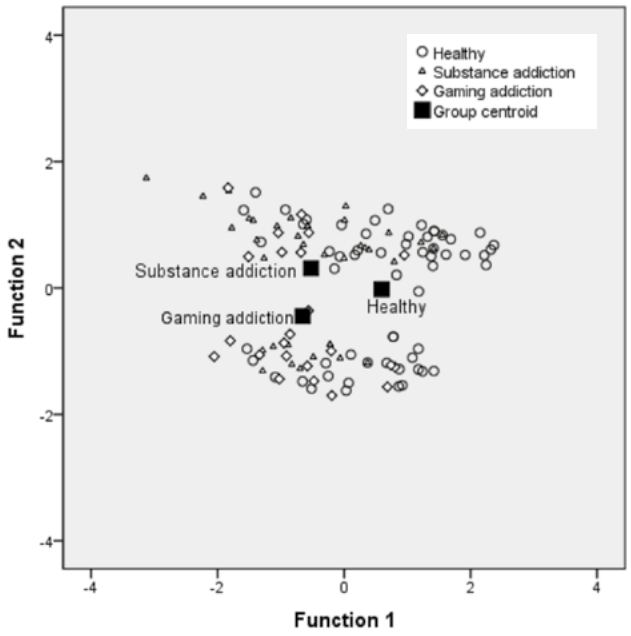


Figure 2. **Scatter diagram for the prediction of patient inclusion in the gaming addiction, substance addiction, or healthy groups by two discriminant functions including sex, conscientiousness, and school maladjustment.**

Figure 2 shows the scatter diagram for these discriminant functions. The first had an eigenvalue of 0.352 and explained 83.2%% of the variance and the second had an eigenvalue of 0.071 and explained 16.8% of the variance.

Finally, table 4 shows the result of multinomial logistic regression including the variables that were significative in the ANOVA. This model explains 47.4% (*pseudo R2* = 0.474) of the variance and correctly classifies 72% of the participants (healthy = 77.6%, substance addiction = 73%, and gaming addiction = 56.5%). The variables that predicted substance addiction were neuroticism (p = .040), clinical maladjustment (p = .020), school maladjustment (p = .048) and total emotional symptoms index (p = .006). The variables that predicted gaming disorders were being man (p = .029) and school maladjustment (p = .047).

Discussion

The main purpose of this study was to explore the relationship between IGD, personality, and psychopathology, as well as its delimitation as a new addiction diagnosis and its differences with substance addiction. This knowledge is crucial to positioning IGD as a behavioural addiction but also, given that SMC is associated with this disorder, to facilitate the development of IGD prevention programs.

Regarding personality, a positive association between IGD and neuroticism as well as a negative association between IGD and extraversion and conscientiousness (Borzikowsky et al., 2018; Bouna-Pyrrou et al., 2018; Laier et al., 2018) have been found. In fact, neuroticism and conscientiousness are not only associated with IGD, but also with a general propensity to develop addictive disorders (Dash et al., 2019). Along these lines, in the discriminant equations we found that healthy people differed from addicts in conscientiousness, according to studies finding that conscientiousness is a protective factor against addiction (Dash et al., 2019) and

Table 4. ***Multinomial logistic regression (Reference category: Healthy).***

	SUBSTANCE ADDICTION		VIDEO GAME ADDICTION	
VARIABLE	**OR (95% CI) *p***	**AUC (95% CI) *p***	**OR (95% CI) *p***	**AUC (95% CI) *p***
SEX: MAN	1.59 (0.48-5.28) 0.441		4.82 (1.17-19.81) 0.029*	0.34 (0.22-0.47) 0.024*
CONCIENTIOUSNESS	0.92 (0.83-1.02) 0.130		0.89 (0.79-1.00) 0.053	
OPENNESS	1.01 (0.92-1.11) 0.718		1.09 (0.99-1.21) 0.072	
AGREEABLENESS	1.03 (0.95-1.11) 0.431		0.97 (0.88-1.07) 0.606	
NEUROTICISM	1.07 (1.00-1.14) 0.040*	0.71 (0.62-0.81) <0.001**	0.98 (0.91-1.05) 0.688	
CLINICAL MALADJUSTMENT	1.10 (1.01-1.20) 0.020*	0.71 (0.62-0.82) <0.001**	0.95 (0.85-1.05) 0.352	
SCHOOL MALADJUSTMENT	1.06 (1.00-1.13) 0.048*	0.72 (0.63-0.81) <0.001**	1.08 (1.00-1.17) 0.047*	0.61 (0.49-0.74) 0.78
PERSONAL ADJUSTMENT	0.94 (0.88-0.99) 0.047*	0.34 (0.23-0.44) 0.006**	1.02 (0.92-1.13) 0.621	
TOTAL EMOTIONAL SYMPTOMS INDEX	0.86 (0.78-0.96) 0.006*	0.60 (0.49-0.71) 0.079	1.10 (0.98-1.24) 0.098	

Note. OR: Odds Ratio, AUC: Area Under the Curve, CI: Confidence Interval.

a negative association between IGD and conscientiousness (Vollmer, Randler, Horzum & Ayas, 2014). In terms of substance addiction, most studies only analysed a limited number of traits or focused on a single substance, making it difficult to integrate the body of evidence across traits or substances. However, low conscientiousness seems to be consistently associated with tobacco, marijuana, heroin, or cocaine use (Terracciano, Löckenhoff, Crum, Bienvenu & Costa, 2008).

In regression, neuroticism predicted addiction to substances, but not to video games. Our results show that neuroticism was a risk factor for substance addiction. Although neuroticism is a relevant personality trait in adult population, we found no association between neuroticism and IGD in line with previous studies done with adolescents. This might be because emotionality instability is less important in younger population with GD than in adults (López-Fernández et al., 2020). It could also be because the difference between healthy and addicted to substances in this variable is so considerable that it masks the possible difference between healthy and addicted to video games. In fact, the studies that find a relationship between neuroticism and conscientiousness and video game addiction directly compare with healthy ones, without including the comparison with substance addicts (Bouna-Pyrrou et al., 2018; Laier et al., 2018).

We found no significant association between IGD and extraversion. This might be because introverts usually prefer to engage in relationships that reduce face-to-face communication and feel more comfortable in the anonymity of the internet (Braun, Stopfer, Müller, Beutel & Egloff, 2016). Moreover, a wide range of videogame genres is now available, allowing some people to use gaming as a way to connect with their peers and strengthen their relationships. In fact, many games are designed for multiple players and encourage them to work together, supporting the hypothesis that cooperative gaming may promote prosocial behaviour (Lobel et al., 2017).

Focusing on psychopathology, compared to healthy controls, our results showed higher SMC scores for both substance addiction and IGD, with no significant differences between these addictions. While some authors propose that the use of new technologies and electronic media may be useful for creating positive social behaviour, to prevent violence, and enhance academic performance (Khatib et al., 2018), most authors have focused on the strong association between IGD and poor academic performance, including ignoring school homework and falling grades (Buiza-Aguado et al., 2018; Naskar et al., 2016; Singh, 2019). In fact, some authors propose that academic decline should be considered a screening tool or as a 'red flag' in clinical interviews for diagnosing IGD (Sussman, Harper, Stahl & Weigle, 2018). We showed a significant relationship between both addictions and high SMC scores; although we did not establish a direct relationship between IGD and school failure, we can affirm that a bad attitude towards school and teachers and SMC are related to IGD.

Our data also indicate that good personal adjustment was protective against substance addiction. In other words, self-confident individuals who felt satisfaction in their relationships with equals and families, were better able to deal with their emotions and cope with daily difficulties and were therefore more protected from developing an addiction.

Others have reported that IGD was associated with depression, anxiety, and social phobia (González Bueso et al., 2018a; Krossbakken et al., 2018). However, CMC and ESI scores in our work were related to addiction to substances but not to video games. Once again, the difference between healthy and addicted to substances could mask the difference with addicted to video games. Nonetheless, we do not know if addictive behaviour is a consequence or a trigger of psychopathology and so the relationship between psychopathology and addiction remains unclear (González-Bueso et al., 2018b). Similarly, we do not know if a specific psychiatric problem leads to the development of IGD, or if its negative consequences cause psychiatric disorders (González-Bueso et al., 2018b). However, the absence of statistical difference between both addictions in this current study suggests that there may be a common neurobiological basis or shared personality traits that could generally predispose individuals to addictive behaviour. This would mean that other factors would determine the development of one addiction or another. For example, in our work being man increased the probability of addiction to video games. This is also supported by the fact that many personality traits are protective for addictive behaviours, without discriminating between substances or behavioural addictions. Thus, perhaps our findings were the result of addiction and psychopathology sharing underlying biological, sociodemographic, or psychological mechanisms, making people vulnerable to both and, therefore, explaining their co-occurrence (González-Bueso et al., 2018a).

According to the review by King et al. (2018), most prevention programs use selective strategies (aimed at a subpopulation with a higher risk of developing IGD) and involved psycho-education modules designed to help participants understand the problematic use of videogames; teach stress management and self-control techniques; develop social relationships; internet time limit-setting and time management skills; and identify alternative activities. In this current work we found that the profile of participants with an IGD was male, with low conscientiousness and SMC. Thus, modules to help prevent IGD would likely be more effective if they (1) detect emotional distress or psychopathology

(i.e., working on self-awareness) and teach emotional regulation strategies; (2) promote conscientiousness; and (3) explore adaptations and attitudes towards school.

It is important to interpret our findings in light of their limitations. First, there is still no consensus on which diagnostic criteria or psychometric instruments should be used to research IGD; some of the tests we used omitted important variables such as video game type, time spent playing, or academic performance, which later limited comparisons with other studies and the extrapolation of our conclusions. Although the terms Internet Gaming Disorder (IGD), Gaming Disorder (GD) and substance use disorders (SUDs) have been used in the text, given that these categories have been obtained through screening tests, readers may consider them as high risk of disorder rather than disorders themselves. Second, the cross-sectional design of this work means that causality could not be established; longitudinal studies could help establish causality and detect the directionality of the relationship between addictions and psychopathology. It would also be helpful to continue studying personality traits in addictive behaviours and in reference to different videogame types, which might be helpful in developing more specific prevention programs for certain personality styles. Third, although the subjects included and excluded from the study did not show differences in sex, age and having repeated course, there were differences in coexistence, with the subjects included in a greater proportion living with a single parent. This could suppose a selection bias because all addicted subjects were included, since addiction has been related to parental loss and the separation or divorce of parents (Abasi & Mohammadkhani, 2016).

In conclusion, high levels of conscientiousness are protective and school maladjustment is a risk factor in developing both substance and video games addictions. The equation that predicted classification into the studied groups included the male sex, conscientiousness, and SMC variables. The risk factors for developing GD were male sex and SMC. The risk factors for developing SUD were neuroticism, CMC, SMC, ESI and low PAC.

Author contributions

MSMI, BA & HG conceptualized the paper. HG obtained the founding sources and ethics authorizations. MSMI, AI & CGF collected the data. SLM & RRF performed quality assurance for all data. SLM coordinated database activities. BA performed the data analysis. SLM drafted the paper. All authors assisted with subsequent drafts and were responsible for reviewing and approving the final manuscript. HG supervised the study and all manuscript elaboration.

Acknowledgements

All the authors acknowledge financial support from Universidad Cardenal Herrera – CEU, CEU Universities (IDOC18-07 and pre-competitive projects 2019-2020) and Fundación de Investigación del Hospital Provincial de Castellón (CAF 20-007; 20-017).

Conflict of interests

All the authors declare no conflict of interest.

References

Abasi, I. & Mohammadkhani, P. (2016). Family risk factors among women with addiction-related problems: An integrative review. *International Journal of High Risk Behaviors and Addiction, 5*. doi:10.5812/ijhrba.27071.

Adachi, P. J. C. & Willoughby, T. (2013). More than just fun and games: The longitudinal relationships between strategic video games, self-reported problem solving skills, and academic grades. *Journal of Youth and Adolescence, 42,* 1041-1052. doi:10.1007/s10964-013-9913-9.

Álvarez, S., Gallego, P., Latorre, C. & Bermejo, F. (2001). Papel del Test AUDIT (Alcohol use disorders identification test) para la detección de consumo excesivo de alcohol en Atención Primaria. *Revista de Medicina de Familia y Comunitaria, 11*, 553-557.

Allen, J. P., Litten, R. Z., Fertig, J. B. & Babor, T. (1997). A review of research on the Alcohol Use Disorders Identification Test (AUDIT). *Alcoholism: Clinical and Experimental Research, 21*, 613-619.

American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

Asociación española de videojuegos (2017). *The Yearbook of Videogames 2017*. Retrieved at http://www.aevi.org.es/web/wp-content/uploads/2018/07/AEVI_Anuario2017.pdf.

Araujo, M., Golpe, S., Braña, T., Varela, J. & Rial, A. (2018). Psychometric validation of the POSIT for screening alcohol and other drugs risk consumption among adolescents. *Adicciones,* 30, 130-139. doi:10.20882/adicciones.958.

Barbaranelli, C., Caprara, G. V., Rabasca, A., Barrio, M. V., Carrasco Ortíz, M. A. & Holgado-Tello, F. P. (2013). *BFQ-NA: Cuestionario "Big Fiwe" de personalidad para niños y adolescentes: Manual (3a ed. rev.)*. Madrid: TEA.

Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B. & Monteiro, M. G. (2000). *The alcohol use disorders identification test: Guidelines for use in primary care (Audit)*. World Health Organization. Retrieved at https://apps.who.int/iris/bitstream/handle/10665/67205/WHO_

MSD_MSB_01.6a.pdf;jsessionid=36D81C1C16B-CE8647809E7DDEA7B57EE?sequence=1.

Bhat, P. S., Prakash, J. & Srivastava, K. (2019). Game of thorns: Modern day opium. *Medical journal Armed Forces India*, *75*, 130-133. doi:10.1016/j.mjafi.2018.12.006.

Bonnaire, C. & Baptista, D. (2019). Internet gaming disorder in male and female young adults: The role of alexithymia, depression, anxiety and gaming type. *Psychiatry Research*, *272*, 521-530. doi:10.1016/j.psychres.2018.12.158.

Borzikowsky, C. & Bernhardt, F. (2018). Lost in virtual gaming worlds: Grit and its prognostic value for online game addiction. *American Journal on Addictions*, 27, 433-438. doi:10.1111/ajad.12762.

Bouna-Pyrrou, P., Aufleger, B., Braun, S., Gattnar, M., Kallmayer, S., Wagner, H.,… Lenz, B. (2018). Cross-sectional and longitudinal evaluation of the social network use disorder and internet gaming disorder criteria. *Frontiers in Psychiatry*, *9*, 692. doi:10.3389/fpsyt.2018.00692.

Brand, M., Young, K. S., Laier, C., Wölfling, K. & Potenza, M. N. (2016). Integrating psychological and neurobiological considerations regarding the development and maintenance of specific Internet-use disorders: An Interaction of Person-Affect-Cognition-Execution (I-PACE) model. *Neuroscience and Biobehavioral Reviews*, *71*, 252-266. doi:10.1016/j.neubiorev.2016.08.033.

Braun, B., Stopfer, J. M., Müller, K. W., Beutel, M. E. & Egloff, B. (2016). Personality and video gaming: Comparing regular gamers, non-gamers, and gaming addicts and differentiating between game genres. *Computers in Human Behavior, 55*, 406-412.

Brooks, F. M., Chester, K. L., Smeeton, N. C. & Spencer, N. H. (2016). Video gaming in adolescence: Factors associated with leisure time use. *Journal of Youth Studies*, *19*, 36-54. doi:10.1080/13676261.2015.1048200.

Buiza-Aguado, C., Alonso-Canovas, A., Conde-Mateos, C., Buiza-Navarrete, J. J. & Gentile, D. (2018). Problematic video gaming in a young Spanish population: Association with psychosocial health. *Cyberpsychology, Behavior and Social Networking*, *21*, 388-394. doi:10.1089/cyber.2017.0599.

Canale, N., Marino, C., Griffiths, M. D., Scacchi, L., Monaci, M. G. & Vieno, A. (2019). The association between problematic online gaming and perceived stress: The moderating effect of psychological resilience. *Journal of Behavioral Addictions*, *8*, 174-180. doi:10.1556/2006.8.2019.01.

Caprara, G. V. & Zimbardo, P. G. (1996). Aggregation and amplification of marginal deviations in the social construction of personality and maladjustment. *European Journal of Personality, 10*, 79-110.

Chamarro, A., Carbonell, X., Manresa, J. M., Munoz-Miralles, R., Ortega-Gonzalez, R., Lopez-Morron, M. R.,… Toran-Monserrat, P. (2014). The questionnaire of experiences associated with video games (CERV): An instrument to detect the problematic use of video games in Spanish adolescents. *Adicciones, 26*, 303-311.

Chung, T., Sum, S. & Chan, M. (2018). Time to call for a global public health approach in prevention of the onset and progression of problematic gaming. *Journal of Behavioral Addictions*, *7*, 548-552. doi:10.1556/2006.7.2018.86.

Costa, S. & Kuss, D. J. (2019). Current diagnostic procedures and interventions for gaming disorders: A systematic review. *Frontiers in Psychology*, *10*, 578. doi:10.3389/fpsyg.2019.00578.

Dash, G. F., Slutske, W. S., Martin, N. G., Statham, D. J., Agrawal, A. & Lynskey, M. T. (2019). Big Five personality traits and alcohol, nicotine, cannabis, and gambling disorder comorbidity. *Psychology of Addictive Behaviors*, *33*, 420-429. doi:10.1037/adb0000468.

Del Barrio, V., Carrasco, M. & Holgado-Tello, F. (2006). Análisis transversal de los cinco factores de personalidad por sexo y edad en niños españoles. *Revista Latinoamericana de Psicología*, *38*, 567-577.

Dong, G., Zheng, H., Liu, X., Wang, Y., Du, X. & Potenza, M. N. (2018). Gender-related differences in cue-elicited cravings in Internet gaming disorder: The effects of deprivation. *Journal of Behavioral Addictions*, *7*, 953-964. doi:10.1556/2006.7.2018.118.

Estévez, A., Jauregui, P. & López-González, H. (2019). Attachment and behavioral addictions in adolescents: The mediating and moderating role of coping strategies. *Scandinavian Journal of Psychology*, *60*, 348-360. doi:10.1111/sjop.12547.

European Parliament and Council. (2016). Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation). Retrieved at https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02016R0679-20160504.

Fam, J. Y. (2018). Prevalence of internet gaming disorder in adolescents: A meta-analysis across three decades. *Scandinavian Journal of Psychology*, *59*, 524-531. doi:10.1111/sjop.12459.

Gentile, D. A., Bailey, K., Bavelier, D., Brockmyer, J. F., Cash, H., Coyne, S. M.,… Young, K. (2017). Internet gaming disorder in children and adolescents. *Pediatrics*, *140 (Supl. 2)*, 81-85. doi:10.1542/peds.2016-1758H.

González-Bueso, V., Santamaría, J. J., Fernández, D., Merino, L., Montero, E., Jiménez-Murcia, S.,… Ribas, J. (2018a). Internet gaming disorder in adolescents: Personality, psychopathology and evaluation of a

psychological intervention combined with parent psychoeducation. *Frontiers in Psychology*, *9*, 787. doi:10.3389/fpsyg.2018.00787.

González-Bueso, V., Santamaría, J. J., Fernández, D., Merino, L., Montero, E. & Ribas, J. (2018b). Association between internet gaming disorder or pathological video-game use and comorbid psychopathology: A comprehensive review. *International Journal of Environmental Research and Public Health*, *15*, 668. doi:10.3390/ijerph15040668.

Granic, I., Lobel, A. & Engels, R. C. (2014). The benefits of playing video games. *The American Psychologist*, *69*, 66-78. doi:10.1037/a0034857.

Khatib, M. N., Sinha, A., Gaidhane, A. M., Simkhada, P., Behere, P. B., Saxena, D.,… Syed, Z. Q. (2018). A systematic review on effect of electronic media among children and adolescents on substance abuse. *Indian Journal of Community Medicine*, *43 (Supl. 1)*, 66-72. doi:10.4103/ijcm.IJCM_116_18.

Kim, Y. J., Lim, J. A., Lee, J. Y., Oh, S., Kim, S. N., Kim, D. J.,… Choi, J. S. (2017). Impulsivity and compulsivity in Internet gaming disorder: A comparison with obsessive-compulsive disorder and alcohol use disorder. *Journal of Behavioral Addictions, 6*, 545-553. doi:10.1556/2006.6.2017.069.

King, D. L., Delfabbro, P. H., Doh, Y. Y., Wu, A., Kuss, D. J., Pallesen, S.,… Sakuma, H. (2018). Policy and prevention approaches for disordered and hazardous gaming and internet use: An international perspective. *Prevention Science, 19*, 233-249. doi:10.1007/s11121-017-0813-1.

King, D. L. & Potenza, M. N. (2019). Not playing around: Gaming disorder in the International Classification of Diseases (ICD-11). *The Journal of Adolescent Health, 64*, 5-7. doi:10.1016/j.jadohealth.2018.10.010.

Király, O., Urbán, R., Griffiths, M. D., Ágoston, C., Nagygyörgy, K., Kökönyei, G. & Demetrovics, Z. (2015). The mediating effect of gaming motivation between psychiatric symptoms and problematic online gaming: An online survey. *Journal of Medical Internet Research*, *17*. doi:10.2196/jmir.3515.

Kircaburun, K., Griffiths, M. D. & Billieux, J. (2019). Psychosocial factors mediating the relationship between childhood emotional trauma and internet gaming disorder: A pilot study. *European Journal of Psychotraumatology*, *10*. doi:10.1080/20008198.2018.1565031.

Knight, J. R., Goodman, E., Pulerwitz, T. & Durant R.H. (2001). Reliability of the Problem Oriented Screening Instrument for Teenagers (POSIT) in adolescents medical practice. *Journal of Adolescent Health*, *29*, 125-130.

Knight, J. R., Sherritt, L., Shrier, L. A., Harris, S. K. & Chang, G. (2002). Validity of the CRAFFT substance abuse screening test among adolescent clinical patients. *Archives of Pediatrics & Adolescent Medicine*, *156*, 607-614. doi:10.1001/archpedi.156.6.607.

Kökönyei, G., Kocsel, N., Király, O., Griffiths, M. D., Galambos, A., Magi, A.,… Demetrovics, Z. (2019). The role of cognitive emotion regulation strategies in problem gaming among adolescents: A nationally representative survey study. *Frontiers in Psychiatry*, *10*, 273. doi:10.3389/fpsyt.2019.00273.

Krossbakken, E., Pallesen, S., Mentzoni, R. A., King, D. L., Molde, H., Finserås, T. R. & Torsheim, T. (2018). A cross-lagged study of developmental trajectories of video game engagement, addiction, and mental health. *Frontiers in Psychology*, *9*, 2239. doi:10.3389/fpsyg.2018.02239.

Kuss, D. J. (2013). Internet gaming addiction: Current perspectives. *Psychology Research and Behavior Management*, *6*, 125-137. doi:10.2147/PRBM.S39476.

Kuss, D. J., Pontes H. M. & Griffiths M. D. (2018). Neurobiological correlates in internet gaming disorder: A systematic literature review. *Frontiers in Psychiatry, 9*, 166. doi:10.3389/fpsyt.2018.00166.

Laier, C., Wegmann, E. & Brand, M. (2018). Personality and cognition in gamers: Avoidance expectancies mediate the relationship between maladaptive personality traits and symptoms of internet-gaming disorder. *Frontiers in Psychiatry*, *9*, 304. doi:10.3389/fpsyt.2018.00304.

Latimer, W., Winters, K. C. & Stinchfield, R. D. (1997). Screening for drug abuse among adolescents in clinical and correctional settings using the problem oriented screening instrument for teenagers. *American Journal of Drug and Alcohol Abuse*, *23*, 79-98. doi:10.3109/00952999709001689.

Lehenbauer-Baum, M., Klaps, A., Kovacovsky, Z., Witzmann, K., Zahlbruckner, R. & Stetina, B. U. (2015). Addiction and engagement: An explorative study toward classification criteria for internet gaming disorder. *Cyberpsychology, Behavior and Social Networking, 18*, 343–349. doi:10.1089/cyber.2015.0063.

Lemmens, J. S., Valkenburg, P. M. & Peter, J. (2009). Development and validation of a game addiction scale for adolescents. *Media Psychology*, *12*, 77-95.

Lloret, D., Morell, R., Marzo, J. C. & Tirado, S. (2018). Spanish validation of Game Addiction Scale for Adolescents (GASA). *Atención Primaria, 50*, 350-358. doi:10.1016/j.aprim.2017.03.015.

Lobel, A., Engels, R. C., Stone, L. L., Burk, W. J. & Granic, I. (2017). Video gaming and children's psychosocial wellbeing: A longitudinal study. *Journal of Youth and Adolescence*, *46*, 884-897. doi:10.1007/s10964-017-0646-z.

López-Fernández, F. J., Mezquita, L., Griffiths, M. D., Ortet, G. & Ibáñez, M. I. (2020). The role of personality on disordered gaming and game genre preferences in adolescence: Gender differences and person-

environment transactions. *Adicciones*, 33, 263-272. doi:10.20882/adicciones.1370.

Naskar, S., Victor, R., Nath, K. & Sengupta, C. (2016). "One level more:" A narrative review on internet gaming disorder. *Industrial Psychiatry Journal*, *25*, 145-154. doi:10.4103/ipj.ipj_67_16.

Paulus, F. W., Ohmann, S., Von Gontard, A. & Popow, C. (2018). Internet gaming disorder in children and adolescents: A systematic review. *Developmental Medicine and Child Neurology*, *60*, 645–659. doi:10.1111/dmcn.13754.

Porter, G., Starcevic, V., Berle, D. & Fenech, P. (2010). Recognizing problem video game use. *Australian and New Zealand Journal of Psychiatry, 44,* 120-128. doi:10.3109/00048670903279812.

Reynolds, C. R. & Kamphaus, R. W. (2004). *BASC: Sistema de evaluación de la conducta de niños y adolescentes: Manual.* Madrid: TEA.

Rial, A., Kim-Harris, S., Knight, J., Araujo, M., Gómez, P., Braña, T.,… Golpe, S. (2019). Empirical validation of the CRAFFT abuse screening test in a Spanish sample. *Adicciones, 31*,160-169. doi:10.20882/adicciones.1105.

Saunders, J. B., Hao, W., Long, J., King, D. L., Mann, K., Fauth-Bühler, M.,… Poznyak, V. (2017). Gaming disorder: Its delineation as an important condition for diagnosis, management, and prevention. *Journal of Behavioral Addictions*, *6*, 271-279. doi:10.1556/2006.6.2017.039.

Singh, M. (2019). Compulsive digital gaming: An emerging mental health disorder in children. *Indian Journal of Pediatrics, 86*, 171-173. doi:10.1007/s12098-018-2785-y.

Soto, G., Ferrándiz, C., Sáinz, M., Ferrando, M., Prieto, M. D., Bermejo, R. & Hernández, D. (2011). Características psicométricas del cuestionario de personalidad BFQ-NA (Big five questionnaire- niños y adolescentes). *Aula Abierta*, *39*, 13-24.

Statista (2020). *La industria de los videojuegos en España.* Retrieved at https://es.statista.com/temas/2851/industria-del-videojuego-en-espana/.

Sussman, C. J., Harper, J. M., Stahl, J. L. & Weigle, P. (2018). Internet and video game addictions: Diagnosis, epidemiology, and neurobiology. *Child and Adolescent Psychiatric Clinics of North America*, *27*, 307-326. doi:10.1016/j.chc.2017.11.015.

Terracciano, A., Löckenhoff, C. E., Crum, R. M., Bienvenu, O. J. & Costa, P. T. Jr. (2008). Five-factor model personality profiles of drug users. *BMC Psychiatry*, *8*, 22. doi:10.1186/1471-244X-8-22.

Throuvala, M. A., Janikian, M., Griffiths, M. D., Rennoldson, M. & Kuss, D. J. (2019). The role of family and personality traits in Internet gaming disorder: A mediation model combining cognitive and attachment perspectives. *Journal of Behavioral Addictions*, *8*, 48-62. doi:10.1556/2006.8.2019.05.

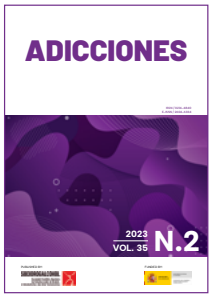
Vollmer, C., Randler, C., Horzum, M. B. & Ayas, T. (2014). Computer game addiction in adolescents and its relationship to chronotype and personality. *SAGE Open*, *4*, 1-9. doi:10.1177/2158244013518054.

World Health Organization. (2018). *11th edition of the International Classification of Diseases.* Retrieved at https://www.who.int/news/item/18-06-2018-who-releases-new-international-classification-of-diseases-(icd-11).

World Medical Association. (2013). Declaration of Helsinki: Ethical principles for medical research involving human subjects. *JAMA*, 310, 2191–2194. doi:10.1001/jama.2013.281053.

SOCIDROGALCOHOL
Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y las otras Toxicomanías

ADICCIONES
2023 ■ VOL. 35 ■ N. 2 ■ PAGES 165–176
www.adicciones.es



ORIGINAL

Evolution of mortality attributable to alcohol in Spain according to age, sex, cause of death and type of drinker (2001-2017)

Evolución de la mortalidad atribuible al alcohol en España según edad, sexo, causa de muerte y tipo de bebedor (2001-2017)

Marta Donat*,**, Luis Sordo**,***, María José Belza*,**, Juan Hoyos***, Enrique Regidor**,***, Gregorio Barrio *,**.

* Escuela Nacional de Sanidad. Instituto de Salud Carlos III, Madrid.

** Centro de Investigación Biomédica en Red de Epidemiología y Salud Pública (CIBERESP).

*** Departamento de Salud Pública y Materno-infantil, Facultad de Medicina, Universidad Complutense de Madrid.

Abstract

There are no recent estimates of alcohol-attributable mortality in Spain with Spanish alcohol consumption data. The objective is to estimate it and know its evolution between 2001 and 2017 in people ≥15 years, according to sex, age, period, cause of death and type of drinker. The cause-specific approach and Levin's equation were used. Survey consumption was corrected for underestimation with respect to sales statistics, and past consumption and binge drinking were considered. The average annual number of deaths attributable to alcohol in 2010-2017 was 14,927, 58.6% of which were premature (<75 years). The age-standardized alcohol-attributable mortality rate was 39.4/100,000 inhabitants, representing 3.9% of overall mortality. Using standardized percentages, 68.7% corresponded to heavy drinkers. The most frequent causes of alcohol-attributable mortality were cancer (44.7%) and digestive diseases (33.2%). The rate of alcohol-attributable mortality was 3.5 times higher in men than in women (with higher ratios for young people and external causes). Between 2001-2009 and 2010-2017, the average annual rate decreased 16.8% (60.7% in 15-34 years; 19.4% in men and 9.8% in women). The contribution of heavy drinkers, digestive diseases and external causes to the risk of alcohol-attributable mortality decreased slightly between the two periods, while the contribution of cancer and circulatory diseases increased. These estimates are conservative. The contribution of alcohol to overall mortality is significant in Spain, requiring collective action to reduce it.

Key words: alcohol, attributable mortality, Spain, type of consumption, cause of death

Resumen

En España no hay estimaciones recientes de la mortalidad atribuible a alcohol con datos de consumo de alcohol españoles. El objetivo es estimarla y conocer la evolución entre 2001 y 2017 en personas ≥15 años, según sexo, edad, periodo, causa de muerte y tipo de bebedor. Se utilizó el enfoque causa específico y la ecuación de Levin. El consumo de las encuestas se corrigió por subestimación con respecto a las estadísticas de ventas y se consideró el consumo pasado y los atracones de alcohol. El número medio anual de muertes atribuibles a alcohol en 2010-2017 fue 14.927, un 58,6% prematuras (<75 años). La tasa de mortalidad atribuible a alcohol estandarizada por edad fue 39,4/ 100.000 habitantes, representando un 3,9% de la mortalidad general. Usando porcentajes estandarizados un 68,7% correspondió a bebedores de alto riesgo. Las causas de mortalidad atribuible a alcohol más frecuentes fueron cáncer (43,8%) y enfermedades digestivas (32,9%). La tasa de mortalidad atribuible a alcohol fue 3,5 veces mayor en hombres que en mujeres (con cocientes más elevados para jóvenes y causas externas). Entre 2001-2009 y 2010-2017 la tasa media anual disminuyó un 16,8% (60,7% en 15-34 años; 19,4% en hombres y 9,8% en mujeres). La contribución de los bebedores de alto riesgo y de las enfermedades digestivas y causas externas al riesgo de mortalidad atribuible a alcohol disminuyó ligeramente entre los dos períodos, mientras que aumentó la contribución del cáncer y enfermedades circulatorias. Estas estimaciones son conservadoras. La contribución del alcohol a la mortalidad general es importante en España, requiriendo medidas colectivas para reducirla.

Palabras clave: alcohol, mortalidad atribuible, España, tipo de consumo, causa de muerte

■ *Received: August 2020; Accepted: March 2021.*

■ ISSN: 0214-4840 / E-ISSN: 2604-6334

■ **Send correspondence to:**
Luis Sordo. Departamento de Salud Pública y Materno-Infantil. Facultad de Medicina. Universidad Complutense de Madrid.
E-mail: lsordo@ucm.es

Alcohol use is one of the main preventable risk factors for morbidity, mortality and disability in the world. Alcohol-attributable mortality (AAM) is perhaps the main indicator of the damage caused by alcohol in population health, and its periodic or routine estimation should serve to guide and assess the efforts of a country or region to prevent it. It is estimated that in 2017, 5.1% of all deaths worldwide were due to alcohol use, with important differences between countries (Institute for Health Metrics and Evaluation [IHME], 2019). The damage caused by alcohol to population health in a given region or subgroup depends above all on the amount of alcohol consumed by each individual in a given time interval (for example, one year), but also on consumption guidelines and patterns (distribution of that amount over time) (Rehm et al., 2017).

Regarding average consumption, alcohol begins to cause harm and increase the risk of illness, injury or death at fairly low average levels of use (Di Castelnuovo et al., 2006; Rehm et al., 2017). The risk curves for most chronic diseases are exponential, so that the greatest contribution of alcohol to mortality risk in many countries is concentrated in high-risk drinkers (those with an average consumption ≥ 60 g/day of pure alcohol in men or ≥ 40 g/day in women), who often show signs of addiction or alcohol use disorder. However, the contribution of drinkers with a lower average consumption may be substantial in some regions or subgroups (Corrao, Bagnardi, Zambon & Arico, 1999; Corrao, Bagnardi, Zambron & La Vecchia, 2004; Rehm, Rehm, Shield, Gmel & Gual, 2013; Rehm, Shield, Gmel, Rehm & Frick, 2013). It would thus be interesting to disaggregate AAM according to the average consumption level (for example, for high and medium/low risk drinkers). In addition, taking into account that some negative effects of alcohol persist after stopping drinking, it would also be relevant to consider the contribution of ex-drinkers to AAM.

In recent years, evidence has been found that heavy episodic drinking (binge drinking) is linked to an increased risk of general mortality, and from specific causes (mainly cardiovascular diseases and external causes) regardless of average consumption (Graff-Iversen et al., 2013; Murray et al., 2002; Plunk, Syed-Mohammed, Cavazos-Rehg, Bierut & Grucza, 2014; Roerecke & Rehm, 2011); not considering the contribution of this pattern of consumption could therefore distort the AAM estimates, especially in the comparison between sociodemographic subgroups (for example, age and sex).

Despite the existence of a certain methodological consensus in AAM estimation (Rehm et al., 2009), the estimations made in Spain are quite disparate (Pulido et al., 2014). Thus, for example, figures have been published on the contribution of AAM to general mortality in the population aged 15 years and over of 2.1% (Fierro, Ochoa, Yánez, Valderrama & Álvarez, 2008) for 1999-2004, of 4.3% (World Health Organization [WHO], 2019) and 7.5% (IHME, 2019; Global Burden of Disease [GBD], 2018) for 2016, and in the population aged 15-64 years of 12.3% in men, and 8.4% in women for 2004 (Rehm et al., 2013a). The main reason for these discrepancies probably lies in the way population-attributable fractions for alcohol use were calculated; this is often based on data on consumption distribution by quantity consumed from other countries or on Spanish data without taking into account the underestimation of consumption in the surveys. Given the spatial variability of the population distribution of the quantities consumed and the consumption patterns over time, the use of valid data on these aspects from the country to which the estimate refers should in principle increase the validity of the AAM estimates.

The purpose of this study was thus to estimate AAM in Spain and ascertain how it evolved between 2001 and 2017 by sex, age group, cause of death and type of drinker, using consumption estimates made with empirical data obtained almost entirely from the Spanish population.

Method

The methodology for estimating AAM was set out in detail in the recently published AAM Report for Spain (Donat, Sordo, Belza & Barrio, 2020) and in a previous methodological article, published in this journal. The total AAM is the sum of AAM from different causes partially or completely attributable to alcohol. The AAM for each cause was estimated by multiplying the number of deaths from that cause by its corresponding population attributable fraction (PAF). Completely attributable deaths, such as those from alcohol use disorder, have a PAF of 1, while the PAF of each partially attributable cause was estimated using a formula which includes the relative risks (RRs) with regard to abstainers and the population prevalences of different categories of alcohol use (ex-drinkers and various ranges of average daily amount consumed). Thus, for 1,000 deaths from a selected cause with a FAP of 0.45, 450 would be considered attributable to alcohol.

FAPs were calculated using eight categories of alcohol use (ex-drinkers, ≤19, 20-39, 40-49, 50-59, 60-79, 80-99, and ≥ 100 grams of pure alcohol/day). The RRs for each of the selected diseases were obtained from different recent international meta-analyses on the subject (Corrao et al., 1999; Rehm et al., 2017; Samokhvalov, Irving & Rehm, 2010). The calculation of prevalences was carried out on the basis of self-reported consumption in the National Health Survey and the European Health Survey in Spain (Instituto Nacional de Estadística [INE], 2019), corrected for underestimation by weighting the quantities consumed with sales statistics (Sordo et al., 2016).

The results were stratified by periods (2001-2009 and 2010-2017), age, sex, cause of death and type of drinker,

with ex-drinkers considered to be those who had not drunk alcohol in the last year, but who had consumed it at least 12 times in any given year in their life, with high-risk drinkers being individuals consuming ≥ 60 g of pure alcohol (men) or ≥ 40 g of pure alcohol (women) daily in the last year, and medium-low-risk drinkers those who had consumed less. Absolute AAM figures were calculated, as were age-standardized AAM rates calculated by five-year age groups, and various age-standardized AAM percentages such as the percentage of AAM over total mortality, the percentage of AAM due to various groups of defined causes over total AAM, and for current drinkers, the percentage of AAM corresponding to high-risk drinkers. The comparison of rates between groups and periods was measured with the rate ratio that measures relative disparity and the difference in rates that measures absolute disparity.

Results

Evolution of the number of deaths attributable to alcohol

During the period 2010-2017 in Spain, an annual average of 14,927 alcohol-attributable deaths occurred among people aged over 15 years, 72.6% in men and 58.6% in those under 75 years of age (premature). Regarding the basic cause of death, 76.7% were due to cancer or digestive diseases and 68.7% occurred in high-risk drinkers.

During 2001-2009, the annual average number of these deaths had been 15,420, of which 76.0% were men, 68.2% premature, 78.1% due to cancer or digestive diseases, 72.7% were high-risk drinkers (Table 1). Focusing on more specific causes, calculations based on Table 1 in the appendix reveal that cirrhosis/chronic liver disease was the partially attributable cause contributing the most to AAM, both in 2010-2017 (36.1%) and in 2001-2009 (42.7%).

Most alcohol-attributable deaths corresponded to causes partially attributable to alcohol (FAP < 1), both in 2010-2017 (84.0%) and in 2001-2009 (80.9%).

For more detail, Table 2 in the appendix includes the average annual number of deaths totally and partially attributable to alcohol by age group and sex for the two periods considered.

Evolution of alcohol-attributable mortality rates

During 2010-2017, the average annual rate of AAM standardized by age per 100,000 inhabitants was 39.4 (65.0

Table 1. ***Evolution of the average annual number of deaths attributable to alcohol by cause, type of drinker, sex and age, in the population aged 15 years and over. Spain, 2001-2017.***

	PERIOD	TOTAL	MEN	WOMEN	AGE GROUPS (years)						
					15-34	35-44	45-54	55-64	65-74	75-84	>=85
TOTAL	**2001-09**	15,420	11,724	3,697	815	1,059	2,127	2,891	3,621	3,401	1,505
	2010-17	14,927	10,844	4,083	268	518	1,878	2,726	3,354	3,511	2,672
CAUSE OF DEATH											
Cancer	**2001-09**	6,314	4,979	1,336	31	187	808	1,420	1,798	1,510	561
	2010-17	6,534	4,995	1,539	20	110	694	1,429	1,809	1,596	877
Circulatory diseases	**2001-09**	653	-291	944	4	-16	-25	-81	-51	359	464
	2010-17	1,229	-16	1,245	-1	-26	-56	-125	16	436	984
Infectious diseases	**2001-09**	193	147	46	6	14	22	28	47	35	41
	2010-17	222	169	53	3	6	17	23	31	60	83
Metabolic diseases	**2001-09**	-476	-43	-433	-2	-4	-8	-30	-85	-161	-187
	2010-17	-471	-49	-422	-1	-2	-9	-26	-55	-135	-243
Digestive diseases	**2001-09**	5,725	4,273	1,452	56	406	897	1,176	1,533	1,276	380
	2010-17	4,918	3,668	1,250	17	160	826	1,091	1,195	1,122	506
Neurological/mental diseases	**2001-09**	89	69	20	11	10	12	11	15	19	11
	2010-17	140	101	39	8	8	14	18	26	35	32
External causes	**2001-09**	2,922	2,590	332	710	462	421	367	364	363	235
	2010-17	2,356	1,977	379	223	262	392	316	332	397	433
TYPE OF DRINKER											
High risk drinkers	**2001-09**	11,210	9,521	1,689	430	705	1,623	2,315	2,845	2,254	1,039
	2010-17	10,248	8,401	1,847	111	264	1,381	2,099	2,651	2,116	1,625
Medium-low risk drinkers	**2001-09**	1,535	906	629	379	326	422	424	332	30	-379
	2010-17	1,729	937	792	153	231	411	462	345	320	-193
Regular ex-drinkers	**2001-09**	2,676	1,297	1,378	6	27	83	154	446	1116	844
	2010-17	2,951	1,507	1,444	4	21	85	164	359	1,074	1,243

Note. The category "other diseases" is not included among the causes of death because no cases are registered.

in men and 18.3 in women). Between 2001-2009 and 2010-2017, this rate saw an absolute change of -7.9/100,000 inhabitants, representing a change of -16.8% in relative terms. The decrease was more pronounced in men (-15.6/100,000 inhabitants and -19.4%) than in women (-2.0/100,000 inhabitants and -9.8%). Furthermore, the relative decline in rates decreased with age, from -60.7% in young people aged 15-34 years to only -11.3% in those older than >= 75 years. In the elderly >= 85 years, the relative decrease was positive (16.6%) (Table 2).

Figure 1 shows the standardized rates of AAM by combined age and sex groups. The rates decreased in all groups, except in men and women >= 85 years, where they increased. The decrease, both in absolute and relative terms, was in general greater in men than in women in all age groups. The strongest relative decline was observed in men aged 15-34 years, with a rate ratio between periods of 2.72.

By type of drinker, the highest rates in both periods corresponded to high-risk drinkers, followed by ex-drinkers and medium-low risk drinkers. Across time periods, rates decreased in high-risk drinkers and former drinkers and increased in medium-low risk drinkers (4.0 and 4.6/100,000 inhabitants) (Table 3, appendix).

Evolution of the contribution of alcohol-attributable mortality to total mortality

This was measured by the percentage of the age-standardized AAM rate over the age-standardized all-cause mortality rate. The contribution of AAM to total mortality did not vary between 2001-2009 and 2010-2017; for both periods it was 3.9%. By age, however, the contribution of AAM decreased very sharply in young people aged 15-34 years (12.4% and 8.6%), and increased for those over 65 years of age (Table 2). Regarding mortality in those aged under 75 years, this percentage stood at 8.3% in the 2001-

Table 2. ***Evolution of the alcohol-attributable mortality rate (AAM) and the contribution of AAM to total mortality, by sex and age, in the population aged 15 years and over. Spain, 2001-2017.***

	2001-2009	2010-2017	Difference between periods[3]	Relative change between periods (%)[4]
			Average annual rates of AAM standardized by age per 100,000 inhabitants[1]	
Total	47.3	39.4	-7.9	-16.8
Men	80.6	65.0	-15.6	-19.4
Women	20.3	18.3	-2.0	-9.8
15-34	6.1	2.4	-3.7	-60.7
35-44	15.2	6.6	-8.6	-56.6
45-54	37.9	27.1	-13.8	-28.5
55-64	63.8	50.5	-13.3	-20.8
65-74	93.9	81.6	-12.3	-13.1
75-84	128.6	114.1	-14.5	-11.3
>=85	186.3	217.3	31.0	16.6
			Contribution of AAM to total mortality (%)[2]	
Total	3.9	3.9	0.0	0.0
Men	5.2	5.0	-0.2	-3.8
Women	2.2	2.3	0.1	4.5
15-34	12.4	8.6	-3.8	-30.6
35-44	12.1	8.5	-3.6	-29.8
45-54	13.7	11.4	-2.3	-16.8
55-64	9.8	8.8	-1.0	-10.2
65-74	5.8	6.3	0.5	8.6
75-84	2.8	3.0	0.2	7.1
>=85	1.2	1.6	0.4	33.3

Note. [1]Average annual rates of AAM standardized by age per 100,000 inhabitants aged 15 years and over. To calculate these, the population figures of residents in Spain on July 1 of each year and the European Standard Population of 2013 were used. [2]This is interpreted as the percentage weight of AAM in all-cause mortality, calculated as follows: (age-standardized alcohol-attributable mortality rate / age-standardized all-cause mortality rate) x 100. [3]Difference between the mean annual mortality rates attributable to alcohol standardized by age for the period 2010-2017 and the corresponding rates for the period 2001-2009. It is expressed in deaths per 100,000 inhabitants and indicates the absolute change in risk or mortality rate between the two periods. Negative and positive values indicate decreases and increases in risk, respectively. The same applies to the percentage of AAM over all-cause mortality standardized by age. [4]The percentage of change (PC) between periods was calculated by subtracting one from the ratio of average annual mortality rates attributable to alcohol standardized by age between the periods 2010-2017 and the period 2001-2009 (RR) and multiplying the result by 100 [PC = (RR-1)*100]. It is unitless and indicates the relative change in risk or mortality rate attributable to alcohol between the two periods. Negative and positive values indicate decreases and increases in risk, respectively. The same applies to the percentage of AAM over all-cause mortality standardized by age.

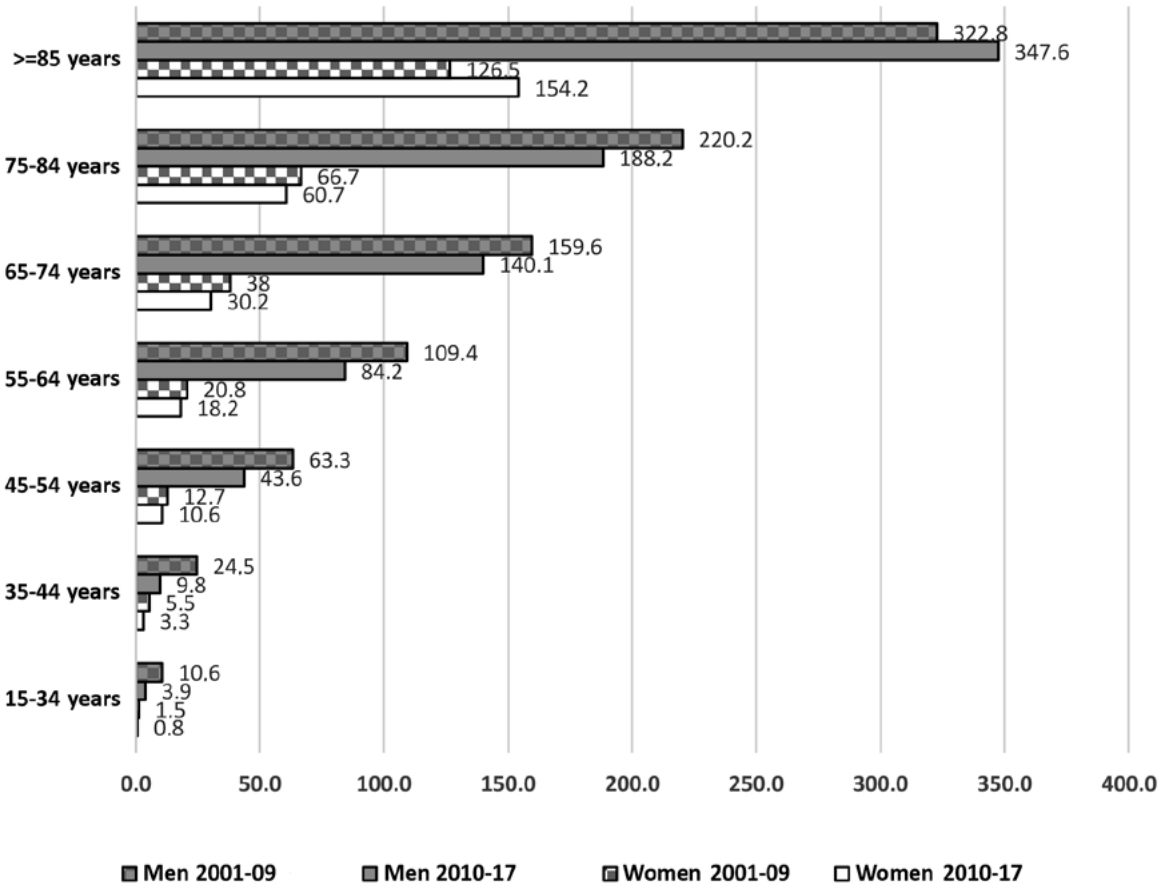


Figure 1. **Average annual mortality rates attributable to alcohol standardized by age1 according to age group, sex and period. Spain, 2001-2017.**

Note. [1] Average annual mortality rates attributable to alcohol standardized by age per 100,000 inhabitants, calculated by five-year age groups. To calculate these, the figures for the population of residents in Spain on July 1 of each year and the European Standard Population for 2013 were used. P1: refers to the period 2001-2009. P2: refers to the period 2010-2017.

2009 period (9.8% in men and 4.9% in women); there was a slight decrease in the following period (2010-2017) to 7.8% (9.2% in men and 4.7% in women).

Evolution of the distribution of alcohol-attributable mortality according to basic cause

During 2010-2017, the four groups of causes contributing most to total AAM were cancer, digestive diseases, injuries from external causes, and circulatory diseases. Between the periods 2001-09 and 2010-17, there were increases in the contributions of cancer (42.1% and 44.7% of AAM) and circulatory diseases (4.7% and 7.4%), while those of digestive diseases (37.4% and 33.2%) and external causes (17.3% and 15.2%) decreased. Some heterogeneity in sex was observed in the temporal changes of these contributions. Thus, for example, the decrease in the contribution of external causes was exclusively due to changes in men, and the decrease in the contribution of digestive diseases was more notable in women than in men.

Regarding heterogeneity in terms of age, the contribution of cancer to the total AAM increased across all ages, except in the range of 45-54 years and in ≥ 85 years, that of circulatory diseases increased especially in those aged ≥ 65 years, that of digestive diseases decreased across all ages, except in the 45-54-year group and those aged ≥ 75 years. In the case of external causes, there was an increase in the 35-54-year range and those aged ≥ 75 years (Table 3). For more detail, the evolution of the AAM rates for the different basic causes can be observed in Table 4 of the appendix, stratified simultaneously by age groups and sex.

Evolution of the distribution of alcohol-attributable mortality by type of drinker

In 2010-2017, the majority of AAM occurred in high-risk drinkers (> 2/3), followed by ex-drinkers and medium-low risk drinkers. The contribution of high-risk drinkers to total AAM was significantly higher in men than in women, while the opposite was true for the other types of drinkers.

Table 3. ***Evolution of the distribution by cause and type of drinker of total alcohol-attributable deaths, by sex and age in the population aged 15 years and over (%). Spain, 2001-2017[1].***

	PERIOD	TOTAL	MEN	WOMEN	AGE GROUPS (years)						
					15-34	35-44	45-54	55-64	65-74	75-84	>=85
CAUSE OF DEATH	**Percentage of total deaths attributable to alcohol standardized by age**										
Cancer	**2001-09**	42.1	44.3	36.9	3.3	17.8	38.3	49.2	49.7	44.4	37.3
	2010-17	44.7	46.8	39.0	8.3	19.7	37.2	52.4	53.9	45.8	32.8
Circulatory diseases	**2001-09**	4.7	-2.0	24.6	0.0	-1.3	-1.2	-2.8	-1.5	10.4	30.9
	2010-17	7.4	0.6	27.0	0.0	-4.5	-3.0	-4.6	0.6	11.8	36.8
Infectious diseases	**2001-09**	1.3	1.4	1.0	0.0	1.3	1.0	1.0	1.3	1.0	2.7
	2010-17	1.5	1.7	1.2	0.0	1.5	0.9	0.8	0.9	1.7	3.1
Metabolic diseases	**2001-09**	-3.4	-0.4	-11.3	0.0	-0.7	-0.4	-1.0	-2.3	-4.7	-12.4
	2010-17	-3.0	-0.5	-9.4	0.0	0.0	-0.5	-1.0	-1.7	-3.7	-9.1
Digestive diseases	**2001-09**	37.4	36.5	39.4	6.6	38.2	42.1	40.7	42.3	37.7	25.3
	2010-17	33.2	33.1	32.1	4.2	31.8	44.1	40.0	35.6	32.3	18.9
Neurological/mental diseases	**2001-09**	0.6	0.6	0.5	1.6	0.7	0.6	0.4	0.4	0.5	0.7
	2010-17	1.0	0.9	0.9	4.2	1.5	0.8	0.6	0.8	1.0	1.2
External causes	**2001-09**	17.3	19.6	8.9	88.5	44.1	19.6	12.7	10.0	10.6	15.6
	2010-17	15.2	17.4	9.2	83.3	50.0	20.7	11.6	9.9	11.2	16.2
TYPE OF DRINKER	**Percentage of all deaths attributable to alcohol standardized by age**										
High risk drinkers	**2001-09**	73.4	82.0	45.8	52.5	66.4	76.3	80.1	78.5	66.3	69.1
	2010-17	69.3	77.5	44.8	41.7	50.0	73.8	77.0	79.0	60.4	60.7
Medium-low risk drinkers	**2001-09**	8.5	4.6	18.2	47.5	30.9	19.8	14.6	9.3	1.1	-25.2
	2010-17	11.7	7.4	22.4	58.3	45.5	21.8	16.8	10.2	9.6	-7.2
Regular ex-drinkers	**2001-09**	18.2	13.4	36.0	0.0	2.6	4.0	5.3	12.2	32.7	56.1
	2010-17	19.0	15.1	32.8	0.0	4.5	4.4	6.1	10.8	30.1	46.4

Note. [1]Percentages were calculated by dividing the age-standardized AAM rate for each cause of death by the age-standardized total alcohol-attributable death rate and multiplying the result by 100. The category "other diseases" is not included among the causes of death because no cases are registered.

By age, the high-risk drinker group contributing the most to AAM was the 65-74-year group, while in medium-low-risk drinkers this was the case in the 15-34-year group, and the ≥ 85-year group took this role in ex-drinkers. Between the periods 2001-2009 and 2010-2017, the percentage of AAM decreased in high-risk drinkers (73.4% and 69.3%) and increased in ex-drinkers (18.2% and 19.0%) and in moderate-low-risk drinkers (8.5% and 11.7%).

Some heterogeneity in sex was observed in the temporal changes of this contribution. Thus, the decrease in the contribution of high-risk drinkers and the increase in that of ex-drinkers was due to respective changes in men, given that the contribution of women high-risk drinkers barely varied and that of women ex-drinkers decreased. By age, the contribution of high-risk drinkers decreased except in the 65-74 age group, and that of medium-low risk drinkers increased in all ages, especially in the 15-34 and ≥ 75-year groups. The contribution of ex-drinkers increased in the group aged 35-64 years and decreased in those aged ≥ 65 years (Table 3).

For more detail, Table 4 of the appendix shows the evolution of the AAM rates for the three types of drinkers, simultaneously stratified by age groups and sex.

Evolution of the disparity by sex in alcohol-attributable mortality

During 2010-2017, the male/female ratio of age-standardized AAM rates was 3.5, with the highest disparity among young people aged 15-34 years (4.8) and the lowest in ≥ 85-year group (2.3). By cause of death, the highest disparity was observed in the group of external causes (6.7), followed by infectious diseases (4.9) and cancer (4.3). Between 2001-2009 and 2010-2017, the male/female rate ratio decreased, from 4.0 to 3.5, with the decrease particularly pronounced in young people aged 15-34 years (7.0 and 4.8). In terms of evolution by cause, the ratio decreased in cancer, neurological/mental diseases and especially in external causes, while it increased in circulatory and infectious diseases. Considering the difference in rates between men and women, a large increase was observed

Table 4. ***Evolution of sex diversity in alcohol-attributable mortality by age and by basic cause in the population aged 15 years and over. Spain, 2001-2017.***

	Male-female rate ratio[1]			Difference in male-female rates[2]		
	2001-17	2001-09	2010-17	2001-17	2001-09	2010-17
TOTAL	3.8	4.0	3.5	53.5	60.3	46.7
15-34 years	6.4	7.0	4.8	6.5	9.1	3.1
35-44 years	3.9	4.4	3.0	12.8	19.0	6.6
45-54 years	4.6	5.0	4.1	41.3	50.5	33.0
55-64 years	5.0	5.3	4.6	77.0	88.7	66.1
65-74 years	4.4	4.2	4.6	115.7	121.6	110.0
75-84 years	3.2	3.3	3.1	140.1	153.5	127.4
>=85 years	2.4	2.6	2.3	195.3	196.3	193.5
Cancer	4.5	4.8	4.3	25.7	28.3	23.3
Circulatory diseases	-0.1	-0.3	0.1	-5.5	-6.5	-4.5
Infectious diseases	4.7	4.4	4.9	0.9	0.8	0.8
Metabolic diseases	0.2	0.1	0.2	1.7	2.0	1.4
Digestive diseases	3.7	3.7	3.7	18.4	21.3	15.6
Neurological / mental diseases	3.9	4.4	3.6	0.4	0.4	0.4
Other diseases	0.0	0.0	0.0	0.0	0.0	0.0
External causes	7.9	9.0	6.7	11.9	14.1	9.6

Note. [1] Rate ratio: ratio of the age-standardized mortality rate in men and women, unitless. [2] Difference in rates2: Difference of standardized rates by age in men and women. It is expressed as the number of deaths attributable to alcohol per 100,000 inhabitants.

with age. By cause, the largest differences during 2010-2017 were seen in cancer and external causes. Between the periods, a decrease in the differences was observed in all ages and causes, except in the 65-74-year-old group and in the case of circulatory, infectious and metabolic diseases (Table 4).

Discussion

Main findings

In the period 2010-2017, an annual average of 14,927 deaths attributable to alcohol occurred in Spain in the population aged 15 years and over, 58.6% of which were premature. AAM represented 3.9% of total mortality. The most frequent causes of AAM were cancer (43.8%), digestive diseases (32.9%) and external causes (15.8%). High-risk drinkers contributed the most to AAM (68.7%), followed by ex-drinkers (19.8%). The age-standardized AAM rate was 3.5 times higher in men than in women, with higher rates for young people and external causes. Between 2001-2009 and 2010-2017, the standardized AAM rate decreased by 16.8%, with a greater decrease in men (19.4%) than in women (9.8%), and in the 15-34-year group (60.7%) than in the 75-84-year group (11.3%),and there was an increase of 16.6% in the group aged 85 and over. In addition, between both periods, the contribution to AAM of high-risk drinkers, digestive diseases and external causes decreased slightly, while that of ex-drinkers, medium-low risk drinkers, cancer and circulatory diseases increased.

Comparison with other estimates of alcohol-attributable mortality

The magnitude of such AAM estimates strongly depends on the methodological options selected; in our study, these were aimed at avoiding overestimation, so the estimates can be considered conservative. The main methodological options leading to a somewhat conservative estimate here are the following: 1) including in the calculations only those causes of death in which there is clear evidence of their relationship with alcohol and valid estimates of the relative risk function according to quantity consumed; 2) attributing ≥ 100 g of pure alcohol/day to consumers with an RR corresponding to 130 g/day; 3) not considering the latency period between alcohol consumption and death in a context in which per capita alcohol consumption is falling; 4) using RR functions usually affected by biases that tend to underestimate the number of deaths attributable to alcohol in some cases by not excluding the ex-drinkers who stopped drinking due to health problems from the category of lifetime abstainers; 5) applying an alcohol content to wine (11.5% ABV) which may be low in the current Spanish context; 6) not taking the risk associated with binge drinking into account in the calculations. Some authors point out that this may cause an underestimation of deaths attributable to alcohol due to cardiomyopathy and ischemic strokes and external causes (Connor, Kydd,

Rehm & Shield, 2013; Roerecke & Rehm, 2010; Sherk, Stockwell, Rehm, Dorocicz & Shield, 2017). However, this would only be the case if the average consumption for said conditions were adjusted for binge drinking, something that was possibly not done in the RRs used.

Focusing on the population aged 15 years and over, the annual estimate obtained for 2010-2017 (14,927) was higher than that of Fierro et al. for 2001-2004 (5,136) (Fierro et al., 2008), which did not correct for underestimation of alcohol consumption in surveys, and lower than that of the WHO study for 2016 (WHO, 2019) (17,828) or the Global Burden of Disease (CBD) for 2017 (32,003) (GBD, 2018; IHME, 2019). This last study reports very high AAM estimates and it would be desirable to know the specific sources from which the empirical data on alcohol consumption in Spain were extracted, but identifying them from the extensive list of sources that the IHME provides on its website is very difficult. In any case, both the prevalence of current drinkers and the daily average amount of alcohol consumed by them seem significantly higher than those estimated in the framework of our study. And high levels of consumption may also have been favoured in the GBD with respect to our study when distributing average consumption among drinkers. Regarding the population aged 15-64 years, the estimate for 2004 (7,585) (Rehm et al., 2013a) is somewhat higher than that obtained in the present study for the same year (6,762). Comparing our estimates with those of other developed countries is a delicate matter. Taking as a reference the WHO study, which estimates the contribution of AAM to general mortality in Spain in 2016 as 4.3%, close to that of this study (3.9% in 2010-2017), it can be seen that both estimates would be below those of countries such as Portugal (5.9%), France (5.8%), Germany (5.2%), United Kingdom (4.6%) or Switzerland (4.5%), and closer to those of Italy (3.6%) or Greece (4.0%) (Rehm et al., 2013b).

Alcohol-attributable mortality by cause of death and type of drinker

In 2001-2017, the causes of death responsible for the highest AAM were, in this order, cancer, digestive diseases, external causes and circulatory diseases, which is consistent with previous studies (IHME, 2019; Shield, Rylett & Rehm, 2016). In international studies, the contribution of the different groups of causes to total AAM is variable. Thus, the figures for cancer, circulatory and digestive diseases and external causes were, respectively, 31%, 21%, 16% and 17% in France in 2009 (Guerin, Laplanche, Dunant & Hill, 2013); 30%, 8%, 21% and 32% in Switzerland in 2011 (Marmet, Rehm & Gmel, 2016); and 36%, 17%, 17% and 17% in Australia in 2015 (National Drug Research Institute [NDRI], 2019). There are also differences between studies regarding disparities by sex in the contribution of the different causes (Guerin et al., 2013). In both our study and GBD-2017 (GBD, 2018; IHME, 2019), the contribution of circulatory diseases increased with age, that of cancer and digestive diseases increased, reaching a peak in 65-74 years and 45-54 years, respectively, and then decreased, and that of external causes was highest in the 15-34-year group (≈80%) and then decreased.

In 2010-2017, 69.3% of AAM in the population aged ≥ 15 years (77.5% in men and 44.8% in women) occurred in high-risk drinkers. This percentage increased with age, peaking at 65-74 years (79.0%). Although there are almost no studies on this topic, those available coincide in indicating a concentration of AAM in high-risk drinkers. Thus, in the 15-64-year group in 2004, 72.2% of deaths attributable to alcohol occurred in high-risk drinkers (76.1% in men and 57.6% in women) in Spain (Rehm et al., 2013a), 74.5% in Italia (Shield, Rehm, Gmel, Rehm & Allamani, 2013), and 77% in the European Union as a whole (Rehm et al., 2013a). In the Swiss population aged 15-74 years in 2011, the percentage was 67% in men and 48% in women (Marmet, Rehm, Gmel, Frick & Gmel, 2014).

Disparities in alcohol-attributable mortality by sex and age

Our results indicate that AAM in Spain during 2010-2017 was 3.5 times higher in men than in women, in line with the GBD-2017 (IHME, 2019; GBD, 2018) and WHO-2016 (WHO, 2019) studies. These estimates are also quite consistent with the male/female ratio of the number admitted to treatment for alcohol abuse/addiction in Spain in 2016 (3.3) (Delegación del Gobierno para el Plan Nacional Sobre Drogas [DGPNSD], 2018), of the prevalence of daily alcohol use in 2017 (3.1) (Ministerio de Sanidad, Consumo & Bienestar Social [MSCBS], 2019) and high-risk alcohol use in 2017 (2.9) (DGPNSD, 2018). The contribution of alcohol to total mortality was also considerably higher in men (5.0%) than in women (2.3%), but sex disparity was less pronounced, as was also the case in GBD-2017 and WHO-2016 (GBD, 2018; IHME, 2019; WHO, 2019). This suggests that sex disparity is greater in AAM than in non-attributable mortality. As in other studies (Guerin et al., 2013), the contribution of cancer and external causes to the total AAM risk was greater in men than in women, while the opposite was the case with circulatory and digestive diseases. Finally, it is also consistent with the aforementioned studies that the increase in the rate of AAM increases greatly with age, although the contribution of alcohol to total mortality is greater in those under 55 years of age (> 8%).

Evolution of alcohol-attributable mortality

In Spain between 2001-2009 and 2010-2017, the average annual rate of AAM fell by almost 8%, a decrease also seen in many European countries, including Mediterranean ones (Shield et al., 2016; WHO, 2019; World Health Organization-Europe [WHO-Europe], 2019). Many

causes of AAM are determined by several factors, including exposure to alcohol, which sometimes interact with each other. Additionally, changes in alcohol exposure can take decades to manifest in mortality. Therefore, in a context of decreasing mortality from many causes, it is possible that part of the decrease in AAM is due to favourable changes in other determinants of the causes of AAM, including improvements in the treatment of underlying diseases. For example, liver cirrhosis can be caused by alcohol and other agents, such as the hepatitis C virus, so the introduction of effective treatments against this virus as of 2014 may have contributed to the decrease in AAM due to digestive diseases. However, most of the decrease in AAM is probably due to the decrease in per capita alcohol consumption, influenced by multiple factors, such as the economic crisis that began in 2008 and subsequent budget cuts, effective road safety interventions or even the greater number of immigrants, with per capita consumption lower than the Spanish-born population (Alonso et al., 2017). In addition, AAM had already been decreasing in Spain before 2001, as evidenced by comparing 1981-1990 and 1999-2004 (Fierro et al., 2008), which is consistent with the decrease in per capita alcohol consumption since the mid-1970s (Ministerio de Sanidad, Servicios Sociales e Igualdad [MSSSI], 2017). Finally, the stability of the contribution of alcohol to general mortality between 2001-2009 and 2010-2017 indicates that the decrease in AAM was similar to that in non-attributable mortality.

The relative decrease in AAM was much stronger in men (-19.4%) than in women (-9.8%), and in the population aged 15-54 years than in the elderly, findings which are corroborated by other earlier results on alcohol-related mortality (MSSSI, 2018) and are consistent with international studies (Marmet et al., 2016; WHO-Europe, 2019). Furthermore, the decline was much greater for external causes and digestive diseases than for cancer. The decrease in AAM due to external causes is consistent with other studies (IHME, 2019) and is probably explained by a decrease in alcohol use, but also by reduced exposure to road traffic and occupational hazards during the economic crisis and the period of cuts in public spending, as well as by the effectiveness of road safety interventions (points-based driving licence, speed controls and penalties for reckless driving). The significant decrease in AAM due to digestive diseases surely reflects the context of declining alcohol use in Spain, since liver cirrhosis, which predominates in these causes, quickly reveals changes in alcohol use (Shield et al., 2016). However, it cannot be ruled out that part of the decline in recent years was due to the control of chronic liver disease linked to hepatitis B and C viruses.

Implications for public health

The almost 15,000 deaths attributable to alcohol in Spain (approximately 4% of total mortality) represent a considerable burden of disease, especially if one takes into account that most are premature and that the estimate is conservative. Thus, premature mortality attributable to alcohol in turn accounts for around 8% of all premature deaths in the period as a whole. While low levels of alcohol consumption in adults may reduce mortality from diabetes or ischemic circulatory diseases, it is clear that at the population level, alcohol use causes many more deaths than it prevents. Many interventions have been shown to be effective in reducing the burden of disease attributable to alcohol, such as pricing and tax policies, restriction of access to alcohol, limitation of advertising and sponsorship, drink-driving controls, educational measures and campaigns, including those involving healthcare professionals, widely available and accessible treatments for alcohol use disorders, etc. Given the concentration of AAM in high-risk drinkers, it is essential to focus interventions on this type of consumption. To this end, however, the most effective in population terms would surely be to develop wide-ranging and efficacious strategies aimed at reducing average consumption in the population as a whole or in all drinkers because this will simultaneously succeed in reducing in high- and medium-low risk consumption.

Acknowledgments

This article is a product of work carried out within the framework of a research project funded by the Government Delegation for the National Plan on Drugs (Delegación del Gobierno para el Plan Nacional sobre Drogas, DGPNSD) [Nº Exp: 2015I040] and the support of the human resources department of the Carlos III Health Institute (Instituto de Salud Carlos III) (ISCIII-PFIS contract, Nº Exp: ENPY-397/18-PFIS). We also wish to thank Cristina Ortiz from the ISCIII for her collaboration in carrying out the analysis of alcohol consumption from some of the population surveys used for the estimates, and the Alcohol Group of the Spanish Epidemiology Society for their support in the completion of this study.

Conflict of interests

The authors declare no conflict of interest related to aspects discussed in this article.

References

Alonso, I., Vallejo, F., Regidor, E., Belza, M. J., Sordo, L., Otero-García, L. & Barrio, G. (2017). Changes in directly alcohol-attributable mortality during the great recession by employment status in Spain: A population cohort of 22 million people. *Journal of Epidemiology and Community Health, 71,* 736-744. doi:10.1136/jech-2016-208759.

Connor, J., Kydd, R., Rehm, J., & Shield, K. (2013). *Alcohol-attributable burden of disease and injury in New Zealand: 2004 and 2007. Research report commissioned by the Health Promotion Agency.* Retrieved at https://www.hpa.org.nz/sites/default/files/Attributable%20fractions%20Final.pdf.

Corrao, G., Bagnardi, V., Zambon, A. & Arico, S. (1999). Exploring the dose-response relationship between alcohol consumption and the risk of several alcohol-related conditions: A meta-analysis. *Addiction, 94*, 1551-1573. doi:10.1046/j.1360-0443.1999.9410155111.x.

Corrao, G., Bagnardi, V., Zambron, A. & La Vecchia, C. (2004). A meta-analysis of alcohol consumption and the risk of 15 diseases. *Preventive Medicine, 38*, 613-619. doi:10.1016/j.ypmed.2003.11.027.

Delegación del Gobierno para el Plan Nacional Sobre Drogas. (2018). *Informes y Estadísticas del Observatorio Español de las Drogas y las Adicciones (OEDA). Estadísticas 2018. Alcohol, tabaco y drogas ilegales en España.* Retrieved at http://www.pnsd.mscbs.gob.es/profesionales/sistemasInformacion/informesEstadisticas/pdf/2018OEDA-ESTADISTICAS.pdf.

Di Castelnuovo, A., Costanzo, S., Bagnardi, V., Donati, M.B., Iacoviello, L. & de Gaetano, G. (2006). Alcohol dosing and total mortality in men and women: An updated meta-analysis of 34 prospective studies. *Archives of Internal Medicine, 166,* 2437-2445. doi: 10.1001/archinte.166.22.2437.

Donat, M., Sordo, L., Belza, M.J. & Barrio, G. (2020). *Mortalidad atribuible al alcohol en España, 2001-2017. Metodología y resultados. Madrid: Delegación del Gobierno para el Plan Nacional sobre Drogas, Ministerio de Sanidad, 2020.* Retrieved at https://pnsd.sanidad.gob.es/profesionales/publicaciones/catalogo/catalogoPNSD/publicaciones/pdf/2020_Mortalidad_atribuible_al_alcohol_en_Espana_2001-2017.pdf.

Fierro, I., Ochoa, R., Yánez, J. L., Valderrama, J. C. & Álvarez, F. J. (2008). Mortalidad y mortalidad prematura relacionadas con el consumo de alcohol en España entre 1999 y 2004. *Medicina Clínica, 131*, 10-13. doi:10.1157/13123036.

Global Burden of Disease. (2018). Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990-2017: A systematic analysis for the Global Burden of Disease Study 2017. *Lancet, 392*, 1923-1994. doi:10.1016/S0140-6736(18)32225-6.

Graff-Iversen, S., Jansen, M.D., Hoff, D.A., Hoiseth, G., Knudsen, G. P., Magnus, P., …Tambs, K. (2013). Divergent associations of drinking frequency and binge consumption of alcohol with mortality within the same cohort. *Journal of Epidemiology and Community Health, 67*, 350-357. doi:10.1136/jech-2012-201564.

Guerin, S., Laplanche, A., Dunant, A. & Hill, C. (2013). Alcohol-attributable mortality in France. *European Journal of Public Health 2013, 23,* 588-593. doi:10.1093/eurpub/ckt015.

Institute for Health Metrics and Evaluation. (2019). *GBD Results Tool. Seatle: Institute for Health Metrics and Evaluation (IHME).* Retrieved at http://ghdx.healthdata.org/gbd-results-tool.

Instituto Nacional de Estadística. (2019). *Encuesta Nacional de Salud. Microdatos.* Retrieved athttps://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica_C&cid=1254736176783&menu=resultados&secc=1254736195295&idp=1254735573175.

Marmet, S., Rehm, J. & Gmel, G. (2016). The importance of age groups in estimates of alcohol-attributable mortality: Impact on trends in Switzerland between 1997 and 2011. *Addiction, 111*, 255-262. doi:10.1111/add.13164.

Marmet, S., Rehm, J., Gmel, G., Frick, H. & Gmel, G. (2014). Alcohol-attributable mortality in Switzerland in 2011--age-specific causes of death and impact of heavy versus non-heavy drinking. *Swiss Medical Weekly, 144*, w13947. doi:10.4414/smw.2014.13947.

Ministerio de Sanidad, Consumo y Bienestar Social. (2019). *Banco de datos.* Retrieved at https://www.mscbs.gob.es/estadEstudios/estadisticas/bancoDatos.htm.

Ministerio de Sanidad, Servicios Sociales e Igualdad. (2017). *Indicadores de Salud 2017. Evolución de los indicadores del estado de salud en España y su magnitud en el contexto de la Unión Europea.* Madrid: Ministerio de Sanidad, Servicios Sociales e Igualdad (MSSSI). Retrieved at https://www.mscbs.gob.es/estadEstudios/estadisticas/inforRecopilaciones/docs/Indicadores2017.pdf.

Ministerio de Sanidad, Servicios Sociales e Igualdad. (2018). *Patrones de mortalidad en España, 2015.* Retrieved at https://www.mscbs.gob.es/estadEstudios/estadisticas/estadisticas/estMinisterio/mortalidad/docs/PatronesMortalidad2015.pdf.

Murray, R.P., Connett, J.E., Tyas, S.L., Bond, R., Ekuma, O., Silversides, C.K. & Barnes, G.E. (2002). Alcohol volume, drinking pattern, and cardiovascular disease morbidity and mortality: Is there a U-shaped function? *American Journal of Epidemiology, 155*, 242-248. doi:10.1093/aje/155.3.242.

National Drug Research Institute. (2019). *Australian alcohol-attributable harm visualisation tool: National Drug Research Institute (NDRI).* Retrieved at http://ndri.curtin.edu.au/aat/index.php.

Plunk, A.D., Syed-Mohammed, H., Cavazos-Rehg, P., Bierut, L.J. & Grucza, R.A. (2014). Alcohol consumption, heavy drinking, and mortality: Rethinking the j-shaped curve. *Alcoholism: Clinical and Experimental Research, 38*, 471-478. doi: 10.1111/acer.12250.

Pulido, J., Indave-Ruiz, B.I., Colell-Ortega, E., Ruiz-Garcia, M., Bartroli, M. & Barrio, G. (2014). Population-based studies on alcohol-related harm in Spain. *Revista Española de Salud Pública, 88*, 493-513. doi:S1135-57272014000400005.

Rehm, J., Gmel, G. E., Sr., Gmel, G., Hasan, O. S. M., Imtiaz, S., Popova, S., ...Shuper, P. A. (2017). The relationship between different dimensions of alcohol use and the burden of disease-an update. *Addiction, 112*, 968-1001. doi:10.1111/add.13757.

Rehm, J., Mathers, C., Popova, S., Thavorncharoensap, M., Teerawattananon, Y. & Patra, J. (2009). Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. *Lancet, 373*, 2223-2233. doi:10.1016/S0140-6736(09)60746-7.

Rehm, J., Rehm, M. X., Shield, K. D., Gmel, G. & Gual, A. (2013a). Alcohol consumption, alcohol dependence and related harms in Spain, and the effect of treatment-based interventions on alcohol dependence. *Adicciones, 25*, 11-18.

Rehm, J., Shield, K.D., Gmel, G., Rehm, M. X. & Frick, U. (2013b). Modeling the impact of alcohol dependence on mortality burden and the effect of available treatment interventions in the European Union. *European Neuropsychopharmacology, 23*, 89-97. doi:10.1016/j.euroneuro.2012.08.001.

Roerecke, M. & Rehm, J. (2010). Irregular heavy drinking occasions and risk of ischemic heart disease: A systematic review and meta-analysis. *American Journal of Epidemiology, 171*, 633-644. doi:10.1093/aje/kwp451.

Roerecke, M. & Rehm, J. (2011). Ischemic heart disease mortality and morbidity rates in former drinkers: A meta-analysis. *American Journal of Epidemiology, 173*, 245-258. doi:10.1093/aje/kwq364.

Samokhvalov, A. V., Irving, H. M. & Rehm, J. (2010). Alcohol consumption as a risk factor for atrial fibrillation: A systematic review and meta-analysis. *European Journal of Cardiovascular Prevention & Rehabilitation, 17*, 706-712. doi:10.1097/HJR.0b013e32833a1947.

Sherk, A., Stockwell, T., Rehm, J., Dorocicz, J. & Shield, K. D. (2017). *The International Model of Alcohol Harms and Policies (InterMAHP)*. Version 1.0: December 2017. Retrieved at www.intermahp.cisur.ca.

Shield, K.D., Rehm, J., Gmel, G., Rehm, M.X. & Allamani, A. (2013). Alcohol consumption, alcohol dependence, and related mortality in Italy in 2004: Effects of treatment-based interventions on alcohol dependence. *Substance Abuse Treatment, Prevention, and Policy, 8,* 21. doi:10.1186/1747-597X-8-21.

Shield, K. D., Rylett, M. & Rehm, J. (2016). *Public health successes and missed opportunities. Trends in alcohol consumption and attributable mortality in the WHO European Region, 1990–2014.* Retrieved at http://www.euro.who.int/__data/assets/pdf_file/0018/319122/Public-health-successes-and-missed-opportunities-alcohol-mortality-19902014.pdf.

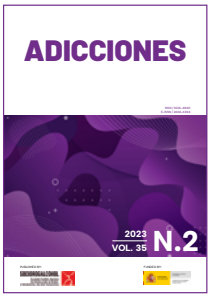
Sordo, L., Barrio, G., Bravo, M. J., Villalbí, J. R., Espelt, A., Neira, M. & Regidor, E. (2016). Estimating average alcohol consumption in the population using multiple sources: The case of Spain. *Population Health Metrics, 14*, 21. doi:10.1186/s12963-016-0090-4.

World Health Organization. (2019). *Global Information System on Alcohol and Health (GISAH).* Retrieved from http://apps.who.int/gho/data/node.gisah.GISAH?showonly=GISAH.

World Health Organization-Europe. (2019). *Status report on alcohol consumption, harm and policy responses in 30 European countries 2019. Copenhagen: World Health Organization. Regional Office for Europe (WHO-Europe).* Retrieved at http://www.euro.who.int/__data/assets/pdf_file/0019/411418/Alcohol-consumption-harm-policy-responses-30-European-countries-2019.pdf?ua=1.

SOCIDROGALCOHOL
Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y las otras Toxicomanías

ADICCIONES
2023 ■ VOL. 35 ■ N. 2 ■ PAGES 177–184
www.adicciones.es



ORIGINAL

Problematic Internet Use and Psychological Problems among University Students with Disabilities

Uso problemático de Internet y problemas psicológicos entre estudiantes universitarios con discapacidad

María J. Pino Osuna *, Carlos Herruzo Pino*, Valentina Lucena Jurado*, Javier Herruzo Cabrera*.

* Departamento de Psicología. Universidad de Córdoba.

Abstract

Problematic internet use (PIU) among people with disabilities has received very little attention in scientific literature. The objective of this work is to study PIU among Spanish university students with disabilities, and determine whether it is related to the presence of psychological problems and discomfort. A total of 432 Spanish university students with disabilities from six universities participated in the study (35% motor disability, 22.7% sensory disability and 42.1% other disabilities, excluding psychical or intellectual disability). PIU in the sample was assessed using the Internet Addiction Test (IAT), while psychological problems were assessed using the Clinical Outcomes in Routine Evaluation-Outcome Measure (CORE-OM). PIU prevalence was 6.3%, and significant differences were found by age (< 22 had a PIU prevalence five times higher), onset of disability (prevalence was 3.7 times higher in those with congenital disability) and main type of internet use (recreational). There were no differences by sex, level of education or type of disability. In all the dimensions measured by CORE-OM (psychological problems, subjective well-being, life functioning and risk of self-harm and harm to others), the prevalence of psychological problems was significantly higher among problematic internet users. In conclusion, university students who are disabled from birth (regardless of their type of disability and sex), under the age of 22, and use the internet mainly for social networking and recreational purposes are at greater risk of psychological distress and are more vulnerable to problems like anxiety and difficulties with social relationships.

Key words: students with disabilities, internet addiction, psychological problems, life functioning, wellness

Resumen

El uso problemático de internet (UPI) entre las personas con discapacidad ha recibido muy poca atención en la literatura científica. El objetivo de este trabajo es estudiar el UPI entre los estudiantes universitarios españoles con discapacidad, y si se relaciona con malestar y problemas psicológicos. En el estudio participaron 432 universitarios españoles con discapacidad de seis universidades (35 %: discapacidad motora, 22,7 %: discapacidad sensorial y 42,1 %: otras discapacidades, excluyendo la discapacidad psíquica o intelectual). El UPI se evaluó mediante el Test de Adicción a Internet (IAT), mientras que los problemas psicológicos se evaluaron mediante el cuestionario Clinical Outcomes in Routine Evaluation-Outcome Measure (CORE-OM). La prevalencia del UPI fue del 6,3 %, y no hubo diferencias estadísticamente significativas por sexo, tipo de discapacidad o estudios. Sí hubo diferencias en función de la edad (< 22 mostraron una prevalencia 5 veces mayor), origen de la discapacidad (discapacidad congénita mostraron una prevalencia 3,7 veces mayor) y tipo principal de uso (recreativo). La prevalencia de problemas psicológicos es significativamente mayor entre los usuarios problemáticos de Internet, en todas las dimensiones medidas por el CORE-OM (problemas psicológicos, bienestar subjetivo, funcionamiento general y riesgo de autolesión y de daño a otros). En conclusión, los estudiantes universitarios con discapacidad desde el nacimiento (independientemente del tipo de discapacidad y del sexo), menores de 22 años y que utilizan Internet principalmente con fines recreativos y las redes sociales tienen mayor riesgo de sufrir trastornos psicológicos y mayor vulnerabilidad a problemas como ansiedad y dificultades en las relaciones sociales.

Palabras clave: estudiantes con discapacidad, adicción a Internet, problemas psicológicos, funcionamiento, bienestar

■ *Received: June 2020; Accepted: March 2021.*

■ ISSN: 0214-4840 / E-ISSN: 2604-6334

■ **Send correspondence to:**
Carlos Herruzo. Departamento de Psicología. Facultad de Ciencias de la Educación. 14071 Córdoba (España).Tel. 957212541.
Email: z42hepic@uco.es

Over the last three decades, use of the internet has exploded. It now constitutes such a high percentage of everyday activity that it is significantly modifying the dynamics of social relationships, forms of communication, mobility, etc. (Hernández, Ortiz & Uribe, 2013). However, parallel to this increase in the use of new technologies, concern is growing about where exactly the boundaries lie between the appropriate and inappropriate use that is made of them. A number of different terms have emerged in scientific literature to refer to this phenomenon. These include "internet addiction", "pathological internet use", "problematic internet use" (PIU), and "excessive internet use" (Echeburúa & Corral, 2010), and all of them refer to an inability to control the use of the internet resulting in psychological, social, school or work difficulties in a person's life (Spada, 2014; Zhou, Li, Li, Wang & Zhao, 2017). The very existence of internet addiction, however, is today still a matter of debate. The DSM-5 classification (American Psychiatric Association, 2013), although it recognizes Non-Substance Related Addictive Disorders within its category of Substance Related and Addictive Disorders, only specifies the pathological gambling disorder, leaving other behavioral addictions as phenomena to be studied in future research. The ICD-11, which includes online gambling and video game disorders, takes the same approach (WHO, 2019).

At the same time, the issue has attracted growing attention throughout this period from the scientific community, with an exponential increase in the number of publications dedicated to internet addiction or PIU (Kuss, Griffiths & Binder, 2013; Lucena, Raya-Trenas, Herruzo & Herruzo, 2019; Ruiz-Olivares, Lucena, Pino & Herruzo, 2010). This is reflected in the profusion of instruments that have emerged for evaluating how different technologies (mobile phones, internet, social networks, video games, etc.) are used, more than 20 of which specifically focus on internet use (Kraus & Rosenberg, 2014).

Despite this general increase in research into both the normal and the problematic use of technologies (Carbonell, Fúster, Chamorro & Obsert, 2012), certain groups of people who are particularly affected by the changes in living habits brought about by such technologies have received very little attention in literature. One such group is that of people with disabilities (Suriá, 2012a). The specific characteristics of these people and their living conditions, which in some cases place them at risk of social isolation, make it necessary to examine how this group is experiencing the great social change of the ICT revolution and establish whether they are being negatively impacted by the use and abuse of technologies to a greater or lesser extent than the "non-disabled" population (Duplaga & Sluzc, 2019). The new technologies have clearly helped people with disabilities to achieve greater autonomy and independence (Igual, Plaza, Medrano & Rubio, 2014). Mobile phones, for example, facilitate contact with people who are not in the same physical space, both for people with and without disabilities (Campbell & Ling, 2009; Perry, O'Hara, Sellen, Brown & Harper, 2001), and can be useful in eliminating some of the barriers faced by people with reduced mobility thanks to apps which promote autonomy, facilitate daily tasks, and thus reduce the sense of stigmatization associated with being disabled (Chib & Jiang, 2014). In the same vein, Söderström (2009) argues that the use of smartphones has facilitated the construction of new identities in people with physical disabilities, allowing them to "hide" and thereby increasing their perception of empowerment, broadening their social relationships, and helping to expand their comfort zones. Söderström also reports that people with disabilities value mobile phones as essential tools of communication to a greater extent than people without disabilities, given that they allow them to request help in certain everyday situations which people without disabilities probably do not experience as often (Söderström, 2011).

In the literature, however, very little attention has been paid to the internet-use-related problems experienced by people with disabilities. Studies have focused almost exclusively on intellectual disability or the phenomenon of cyberbullying (Simpson, Rose & Ellis, 2016), which is suffered by disabled people of different ages (Heiman, Olenik-Shemesh & Eden, 2015; Jenaro, et al., 2018), the harassment being greater the more "visible" the disability is (Kowalski, Morgan, Drake-Lavelle & Allison, 2016). In the case of cyberbullying, ICTs are a medium through which violent behavior occurs, but the literature has scarcely addressed the question of the normal or problematic use of technologies by disabled people, regardless of possible cases of addiction. Lathouwers, de Moor & Didden, (2009) studied how 97 physically disabled adolescents accessed and used internet in the Netherlands. They found no differences between how physically disabled and non-disabled adolescents accessed internet, and the most common online activities were similar for both groups, although abuse was not studied in depth. Suriá (2015), on the other hand, compared abusive internet use in a sample of young people with and without disabilities and found greater technology abuse among people with motor disabilities than among people without disabilities (Suriá, 2012b), both groups showing similar levels of use, around 90%, during adolescence (Adecco, 2017). The sample used in Suriá's study, however, was small and the analysis did not address how the results related to psychological problems found in people without disabilities (Spada, 2014; Zhou et al., 2017). As several critical reviews have already highlighted (Aponte, Castillo & González, 2017; James & Tunney, 2017) the most relevant factor from a social point of view is the effect on people's well-being.

Given, then, that all people, including those with some kind of disability, are exposed to the beneficial and/or harmful effects of internet use, and in view of the scarce amount of research carried out into PIU among disabled people, the objective of this work was to study PIU among Spanish university students with disabilities, and determine whether it is related to the presence of psychological problems and discomfort.

Method

Participants

A total of 432 Spanish university students with disabilities participated in the study. 35% of them had a motor disability, 22.7% a sensory disability and 42.1% other disabilities (not including cognitive disabilities). 25% had been disabled since birth, the disabilities of the other 75% being acquired. 54.4% of the sample were women and 45.6% men. The average age was 41.90 years (SD = 13.77). The sample's homoscedasticity was checked using the chi-square test, comparing groups formed according to disability type and sex. Since no significant results were obtained, it can be said that the sample was homogeneous in these two aspects (χ^2= 2.70; p= .257). Participants were recruited via an e-mailed invitation to participate sent by the Disabled Student Services of 8 universities (the UNED—Spain's National Distance Learning University—and the universities of Valencia, Cadiz, Malaga, Jaén, La Laguna, Barcelona, and the Basque Country) to the people registered on their databases, together with a link to a website. Of a total of 560 people who accessed the website, 23% declined to respond to the survey. With respect to subject areas, 24.4% of the participants were students of Humanities; 41.4% studied Social, Economic and Legal Sciences; 11.9% studied Sciences and Technologies and 22.4% studied Health Sciences. Overall, then, 34.2% were studying sciences and technologies and 65.8% were studying social sciences and humanities.

Instruments

The first part of the survey included a series of questions about the types of disability suffered by the participants, the nature of their disability (inborn or acquired) and the years elapsed since its onset. The questions about disability type included different options (auditory, visual, physical and others). The students with disabilities were contacted through the disability support services of the participating universities. To access such services, the type and degree of a student's disability must have been accredited by a recognized health care institution.

A set of questions was also included about the participants' use of the internet (percentage of time online dedicated to leisure, work, studies, and social networking). To facilitate responses, answer options were established as percentages (0-25%, 25-50%, 50-75%, 75-100%). When a participant gave a 75-100% response, he or she was considered to be making primary use of the internet for the purpose in question. Questions about other sociodemographic characteristics were also included (age, sex, average grade in the previous year, course, specialization, university).

The following instruments were also applied:

Young's Internet Addiction Test (1998), adapted for Spanish speakers by Carbonell et al. (2012) and validated by Fernandez-Villa et al. (2015a) and Pino, Herruzo, Raya, Ruiz-Olivares & Herruzo (2020). This test analyses the extent to which internet use affects a person's daily life, social life, productivity, sleep, and feelings. It consists of 20 items, evaluated using a six-point Likert scale (0 = Never; 1 = Almost Never; 2 = Occasionally; 3 = Frequently; 4 = Often; 5 = Always). Literature reports internal structures ranging from one to six dimensions. In the present study, the Exploratory Factorial Analysis found a three-dimensional structure (CMIN/DF=3.159; AGFI = 0.95; CFI = 0.903; NFI = 0.865; IFI= .904; TLI = 0.876; RMSEA [90% CI] = 0.073 [0.066–0.081]). The author (Young, 2011) proposes a score of 30 as the boundary between normal and pathological use. Other researchers, like Jelenchick, Becker & Moreno (2012) put the borderline at 40 points. Given the controversy about the number of existing factors, in this work we decided to analyze PIU based on a cut-off point of 40, considering those who obtained scores of 40 or more as problematic users, as has been done in other studies with Spanish populations (Fernández-Villa et al., 2015a; Fernández-Villa et al. 2015b). The Cronbach alpha internal consistency coefficient is close to .90. In the present study, the alpha coefficient for the sample was .925.

The Clinical Outcomes in Routine Evaluation-Outcome Measure (CORE-OM), by Evans et al. (2002), adapted for Spanish populations by Trujillo et al. (2016). This is a self-report questionnaire made up of 34 items that evaluate the individual's status based on four dimensions: 1) Subjective well-being/discomfort (4 items); 2) Problems/Symptoms (12 items, measuring anxiety, depression, trauma and physical symptoms); 3) General functioning (12 items, evaluating intimate relationships, social relationships and levels of daily functioning); and 4) Risk (4 items serving as clinical indicators of suicide attempts and self-harm, and 2 items for predicting acts of aggression against third parties). Mean scores below 1 indicate healthy levels. This test's psychometric properties have demonstrated acceptable levels of internal consistency (alpha values of between .75 and .90) and sensitivity in the measurements obtained (Evans et al., 2002) and it has been used in numerous clinical (Connell et al., 2007; Palmieri et al., 2009) and university (Connell et al., 2007; Botella, 2006) contexts.

Procedure

The study procedures were carried out in compliance with the Declaration of Helsinki. Once the study had been approved by the Institutional Review Board (Ethics Committee) of the Andalusian Regional Government (ref. 3050, record 249), the Disabled Student Support Services of the universities were contacted. These services e-mailed their users, inviting them to click on a link to take part in a survey about the use of new technologies by students with disabilities. In the e-mail and on the first page of the questionnaire, they were informed that by completing the survey they were consenting to the use of their responses exclusively for research purposes and with complete confidentiality, and that no data other than their responses to the survey would be recorded. To obtain informed consent, the text also read: "By filling out this survey you agree to voluntarily participate in this study. You may refuse to participate in the study at any time without giving any reasons."

Data Analysis

As the structure of the instrument had been controversial and had not been validated with disabled students, we first assessed its underlying dimensions. For this purpose, we used the Kaiser-Mayer-Olkin Measure of Sampling Adequacy (KMO = 0.938), which verified the sample's suitability. Bartlett's sphericity test x2 = 3434.76; p< .001 indicated a significant relationship between the variables and the feasibility of applying an exploratory factor analysis. A principal component analysis with Varimax rotation and Kaiser normalization was conducted to group the 20 items of the IAT into three components with auto-values greater than 1, which explained 47.80% of the variance. A confirmatory factor analysis (CFA) of the sample was then carried out using the AMOS.18 program, the fit values obtained being acceptable or good (Chi2=470,753, p<.001; minimum discrepancy divided by degrees of freedom CMIN/DF=3,159 (< 5); Adjusted Goodness of Fit Index: AGFI = 0.95 (> .9); Comparative Fit Index CFI = 0.903 (> .9); IFI= .904 (> .9); Tucker-Lewis Index TLI = 0.876 (close to 1); parsimony fit-index: root mean square error of approximation RMSEA [90% CI] = 0.073 [0.066-0.081] (< .08)).

Prevalences were calculated with their respective 95% confidence intervals, while numerical variables were analyzed by calculating mean and standard deviations. The relationship between PIU and psychological, social, and school difficulties and other variables was studied with bivariate and multivariate logistic regression models, calculating Odds Ratios with their respective 95% confidence intervals and making adjustments for sex, age and degree. These analyses were performed using the SPSS statistical package.

Results

As stated in the Analysis section, an exploratory factor analysis was first carried out, followed by a confirmatory analysis to check the factorial structure and adjustment of the questionnaire, which had not been used before with disabled people. Given the controversy regarding its structure, however, in the present work we used the score for the complete questionnaire, the cut-off point for PIU being 40, as mentioned in the Instruments section.

As can be seen in Table 1, PIU prevalence in the sample was 6.3%, with no statistically significant differences by sex and type of disability. With regard to age, participants under 22 had a prevalence (Odds Ratio: OR) five times higher than those who were older. In participants who had been disabled from birth, PIU prevalence was 3.7 times higher.

As can be seen in Table 2, the prevalence of CORE-OM scores above the cut-off point for risk of clinical problems (clinically significant discomfort) was significantly higher among problematic internet users, in all the dimensions measured by this instrument, than among those with normal values, with odds ratio values ranging from 3.18 for

Table 1. ***PIU prevalence by sociodemographic variables.***

		N	n	%	OR	95% CI	B	*p*
Disability type	Motor	142	9	6.3	1.203	.464-3.117	.185	.704
	Sensory	87	6	6.9	1.317	.453-3.828	.275	.613
	Other	169	9	5.3	1			
Age	<22	41	8	19.5	1			
	>= 22	357	16	4.5	.194	.077-.486	-1.642	< .001
Origin	Inborn	90	11	12.2	1			
	Acquired	274	10	3.6	.272	.111-.664	-1.302	.004
Sex	Male	181	12	6.6	1			
	Female	217	12	5.5	1.213	.531-2.770	.193	.647
Studies	Sciences and -Tech	124	8	6.5	1			
	Hum-Soc/Econ/Leg	238	14	5.9	.906	.370-2.223	-.098	.830

Note. N: Non-problematic users of Internet. n: Problematic Users. %: Percentage of problematic users. OR: Odds Ratio. B: Coefficient B.

Table 2. ***Relationships between PIU (IAT) and Psychological Problems (CORE-OM).***

		N	n	%	OR	95% CI	B	*p*
CORE-OM	Non-clinical	264	8	3	1			
	Clinical	107	11	10.3	3.667	1.432-9.391	1.387	.007
Problems	Non-clinical	256	8	4.1	1			
	Clinical	116	12	10.3	3.577	1.421-9.006	1.275	.007
Anxiety	Non-clinical	284	8	2.8	1			
	Clinical	89	12	13.5	5.377	2.122-13.621	1.682	< .001
Depression	Non-clinical	258	8	3.1	1			
	Clinical	114	12	10.5	3.676	1.460-9.260	1.302	.006
Traumatic Symptoms	Non-clinical	265	9	3.4	1			
	Clinical	107	11	10.3	3.22	1.338-7.478	1.170	.006
Subjective Wellness	Non-clinical	257	6	2.3	1			
	Clinical	115	14	12.2	5.396	2.083-13.977	1.686	.001
General Functioning	Non-clinical	264	8	3	1			
	Clinical	107	11	10.3	3.560	1.484-8.541	1.270	.004
Social Relationships	Non-clinical	279	6	2.2	1			
	Clinical	92	13	14.1	6.825	2.580-18.053	1.921	< .001
Close Relationships	Non-clinical	278	0	0	1			
	Clinical	94	2	2	3.187	1.388-7.317	1.159	.006
Risk	Non-clinical	270	7	2.6	1			
	Clinical	102	13	12.7	5.126	2.059-12.765	1.634	< .001

Note. N: Non-problematic users of Internet. n: Problematic Users. %: Percentage of problematic users. OR: Odds Ratio. B: Coefficient B.

Table 3. ***Relationship between PIU (IAT) and type of Internet use.***

Type of use	Percentage of use	N	n	%	OR	95% CI	B	*p*
Work & study	0-75%	272	22	7.5	1			
	75-100%	102	2	1.9	.141	.027-. 740	-1.959	.021
Social Networking	0-75%	351	16	4.3	1			
	75-100%	23	8	25.8	7.630	2.484-22.651	2.015	< .001
Leisure	0-75%	369	19	4.9	1			
	75-100%	5	5	50	10.865	2.494-47.335	2.386	.001

Note. N: Non-problematic users of Internet. n: Problematic Users. %: Percentage of problematic users. OR: Odds Ratio. B: Coefficient B.

close relationships to 6.8 for social relationships, and from 5.39 for subjective wellness to 5.37 for anxiety.

The relationship between different types of internet use (mainly for work and study, for social networking, and for other leisure activity) was also explored (see Table 3). 50% of those who spent more than 75% of their internet time engaged in recreational activity had PIU, compared to only 4.9% of those who spent less time on recreational usage. In the case of people who used the internet mainly for work and studies, however, the result was reversed, with 1.9% of those who used it more than 75% of the time for studying having PIU, and the percentage for those who used it less than 75 % of the time for work and study rising to 7.5%.

Discussion

The objective of this study was to analyze Problematic Internet Use among university students with disabilities and determine whether it is related to the presence of psychological problems and discomfort. The results showed that students over 22 years of age with an acquired disability and who mainly use internet for work and/or studying have less risk of PIU, regardless of their type of disability, sex, or branch of studies. In contrast, those under 22 with an inborn disability and who mainly use internet for social networking and other recreational activities have a higher risk of PIU. PIU was also found to be associated with a higher prevalence of psychological problems and distress.

The rate of PIU among disabled people was found to be 6.3%, a figure similar to that obtained by Fernández-Villa et al. (2015a) using the same instrument in university students without disabilities. This contradicts the results of Suriá (2015), who found a higher level of problematic use among disabled students than among non-disabled students. These differences, however, may be due to the small size of Suriá's sample (n=128) and the fact that she used a different instrument, namely the "Internet-Related Experiences Questionnaire" (CERI) developed by Beranuy, Chamarro, Graner & Carbonell (2009). This questionnaire

uses the DSM-IV-TR criteria for substance abuse and pathological gambling and, like the IAT used in the present study, has been validated for a Spanish population, so it is very likely that the differences found have to do with the small size of the sample and/or the sampling method ("snowball").

Our results showed no difference with regard to disability type. This also contradicts the results obtained by Suriá (2015), which showed a higher prevalence of PIU among those with motor disability. More research is needed to help clarify these discrepancies but, again, they are probably explained by Suriá's use of the "snowball" sampling method. On the other hand, our study found significant differences according to the origin of the disability, with a higher prevalence among those with inborn disability than among those with acquired disability. The figures we obtained are inevitably dynamic because of the instruments we used and because PIU is a changing and probably growing phenomenon. It is a problem that clearly affects a significant percentage of the population with disabilities, so more research is needed.

Given the scarcity of literature on the problem of PIU among people with disabilities, our study is one of the first to have provided data that throws light on the impact the new technologies are having on this group. Duplaga & Sluzc (2019) found that internet use was related to feelings of happiness and better mental health, but in their study they only included a dichotomous question about whether or not people used the internet. Our study, however, is based on an instrument that directly measures PIU. The results obtained by Duplaga & Sluzc (2019) confirm that non-problematic internet use has a positive effect in the sense that it is likely to facilitate greater autonomy, independence (Igual et al., 2014), and contact with people who are not in the same physical space (Campbell & Ling, 2009; Perry et al., 2001), and may also be useful in eliminating some of the barriers faced by people with reduced mobility (Chib & Jiang, 2014).

Our study also shows that people with disabilities who display PIU have significantly more psychological problems than those whose use of such technology is normal or more controlled. In this respect, Kraut et al. (1998) reported a positive correlation between internet use and depression, loneliness, and stress. Miller (2008) also found a significant negative relationship between frequency of video game use and degrees of well-being in people with spinal cord injuries. The present study confirms the relationship found in other studies between PIU and the presence of psychological distress and problems like depression, anxiety, and difficulties with social relationships in the disabled population.

It is noteworthy that in all the dimensions of psychological distress studied with the CORE-OM, an instrument which provides cut-off points to indicate the presence of problems, prevalence is significantly higher among those with PIU. The data obtained in this study show that the prevalence figures for psychological distress and anxiety are also more than five times higher. The figures obtained for the risk of self-harm or harm to others (Risk), which is also 5 times higher among those with PIU than among those whose use of internet is normal, reinforce the idea of PIU as a real problem worthy of attention, without even entering into the controversy of whether or not excessive internet use should be considered an addiction.

We also found that problematic social relationships are more than six times more frequent among those who have PIU than among those who do not. Taking into account the data obtained by Duplaga & Sluzc (2019) and Campbell & Ling (2009), this seems to suggest that the appropriate use of the internet favors inclusion, but that PIU favors isolation.

In short, the relationship between, on the one hand, psychological distress, psychological problems, bad social relationships, and anxiety and, on the other, problematic internet use seems to indicate that internet "addiction" may be fulfilling a distress avoidance function through social isolation or through experiential avoidance, as already suggested in other studies (James & Tunney, 2017; Lucena et al., 2019), and that this may be encouraging more isolation and therefore more addiction. This would be consistent with the higher prevalence of PIU found among people who are disabled from birth and among those who use the internet primarily for other, recreational purposes. However, the cross-sectional nature of the study prevents us from establishing whether it is psychological problems that lead to PIU or PIU that leads to psychological problems, or whether the two types of problem are mutually reinforcing, so further research is needed based on longitudinal designs.

In conclusion, university students under the age of 22, with inborn disabilities (regardless of type) and who use the internet mainly for social networking and recreational purposes are at greater risk of psychological distress and problems.

Acknowledgements

Funding sources: Project PID2020?117172RB-100 funded by ERDF / Ministry of Science and Innovation - State Research Agency (Spain). The authors would like to thank the Disabled Student Services of the National Distance Education University (UNED) and the Universities of Valencia, the Basque Country, Jaén, Cádiz, Málaga, La Laguna and Barcelona for their collaboration.

Conflict of interest

The authors declare no conflict of interest.

References

Adecco (2017). *Informe Infoempleo- Adecco. Redes Sociales y Mercado de Trabajo en España*. Retrieved at https://www.adeccogroup.es/wp-content/uploads/2017/11/Informe-2017-Empleo-y-Redes.-Infoempleo-Adecco.pdf.

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

Aponte, R., Castillo, P. & González, J. (2017). Prevalencia de adicción a internet y su relación con disfunción familiar en adolescentes. *Revista Clínica de Medicina de Familia, 10*, 179-186.

Botella, L. (2006). Routine evaluation in psychotherapy service: The use of CORE System data. *European Journal of Psychotherapy & Counselling, 8*, 235-241. doi:10.1080/13642530600714672.

Beranuy Fargues M., Chamarro Lusar A., Graner Jordania C. & Carbonell Sánchez X. (2009). Validación de dos escalas breves para evaluar la adicción a internet y el abuso de móvil. *Psicothema, 21*, 480-485.

Campbell, S. W. & Ling, R. (2009). Effects of mobile communication. *Media Effects: Advances in Theory and Research*, 592-606. Retrieved at http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.501.7868&rep=rep1&type=pdf.

Carbonell, X., Fúster, H., Chamarro, A. & Oberst, U. (2012). Internet and mobile phone addiction: A review of Spanish empirical studies. *Psychologist's Papers*, *33*, 82-89.

Chib, A. & Jiang,, Q. (2014). Investigating modern-day Talaria: mobile phones and the mobility-impaired in Singapore. *Journal of Computer-Mediated Communication*, *19*, 695-711. doi:10.1111/jcc4.12070.

Connell, J., Barkham, M., Stiles, W. B., Twigg, E., Singleton, N., Evans, C. & Miles, J. V. (2007). Distribution of CORE-M scores in a general population, clinical cut-off points and comparison with the CIS –R. *British Journal of Psychiatry, 190*, 69-74. doi:10.1192/bjp.bp.105.017657.

Duplaga M. & Szulc K., (2019). The association of internet use with wellbeing, mental health and health behaviours of persons with disabilities. *International Journal of Environmental Research and Public Heatlh*, *16,* 3252. doi:10.3390/ijerph16183252.

Echeburúa, E. & De Corral, P. (2010). Addiction to new technologies and social networks in young people: A new challenge. *Addictions*, *22*, 91-96.

Evans, C., Connell, J., Barkham, M., Margison, F., McGrath, G., Mellor-Clark, J. & Audin, J. (2002). Towards a standardised brief outcome measure: Psychometric properties and utility of the CORE-OM. *British Journal of Psychiatry, 180,* 51–60. doi:10.1192/bjp.180.1.51.

Fernández-Villa, T. Molina, A., García-Martín, M. Llorca, J., Delgado-Rodríguez, M. & Martín, V. (2015a). Validation and psychometric analysis of the Internet Addiction Test in Spanish among college students. *BMC Public Health, 15*, 953-963. doi:10.1186/s12889-015-2281-5.

Fernández-Villa, T., Alguacil, J., Almaraz, A., Cancela, J. M., Delgado-Rodríguez, M., García-Martín, M. … Martín, V. (2015b). Problematic internet use in university students: Associated factors and differences of gender. *Adicciones, 27,* 265-275. doi:10.20882/adicciones.751.

Heiman, T., Olenik-Shemesh, D. & Eden, S. (2015). Cyberbullying involvement among students with ADHD: Relation to loneliness, self-efficacy and social support. *European Journal of Special Needs Education*, *30*, 15-29.

Hernández, J., Ortiz, R. & Uribe, A. (2013). Innovation and technological knowledge in the society of the 21st century: The ICT revolution. *Nueva Época*, *13*, 89-96.

Igual, R., Plaza, I., Medrano, C. & Rubio, M. A. (2014). Personalizable smartphone-based system adapted to assist dependent people. *Journal of Ambient Intelligence and Smart Environments*, *6*, 569-593. doi:10.5555/2693820.2693822.

James, R. J. & Tunney, R. J. (2017). The need for a behavioural analysis of behavioural addictions. *Clinical Psychology Review*, *52*, 69-76. doi:10.1016/j.cpr.2016.11.010.

Jelenchick, L. A., Becker, T. & Moreno, M. A. (2012). Assessing the psychometric properties of the Internet Addiction Test (IAT) in US college students. *Psychiatry Research*, *196*, 296-301. doi:10.1016/j.psychres.2011.09.007.

Jenaro, C., Flores, N., Vega, V., Cruz, M., Pérez, M. C. & Torres, V. A. (2018). Cyberbullying among adults with intellectual disabilities: Some preliminary data. *Research in Developmental Disabilities*, *72*, 265-274. doi:10.1016/j.ridd.2017.12.006.

Kowalski, R. M., Morgan, C. A., Drake-Lavelle, K. & Allison, B. (2016). Cyberbullying among college students with disabilities. *Computers in Human Behavior*, *57*, 416-427. doi:10.1016/j.chb.2015.12.044.

Kraus, S. & Rosenberg, H. (2014). The pornography craving questionnaire: Psychometric properties. *Archives of Sexual Behavior*, *43*, 451-462. doi:10.1007/s10508-013-0229-3.

Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukophadhyay, T. & Scherlis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological well-being? *American Psychologist, 53*, 1017–103. doi:10.1037/0003-066X.53.9.1017.

Kuss D. J., Griffiths M. D. & Binder J. F. (2013). Internet addiction in students: prevalence and risk factors.

Computers in Human Behavior. *29,* 959–66. doi:10.1016/j.chb.2012.12.024.

Lathouwers, K., de Moor, J. & Didden, R. (2009). Access to and use of internet by adolescents who have a physical disability: A comparative study. *Research in Developmental Disabilities*, *30*, 702-711. doi:10.1016/j.ridd.2008.09.003.

Lucena, V., Raya-Trenas, A., Herruzo, J. & Herruzo, C. (2019). Addiction or abuse of ICTs? In: M. J. Osuna & Mª I. Amor (Eds.), *La transversalidad de género* (pp. 111-121). Madrid: Síntesis.

Miller, S. M. (2008) The effect of frequency and type of internet use on perceived social support and sense of well-being in individuals with spinal cord injury. *Rehabilitation Counseling Bulletin, 51,* 148–158.

Palmieri, G., Evans, C., Hansen, V., Brancaleoni, G., Ferrari, S., Porcelli, P., ... Rigatelli, M. (2009). Validation of the Italian version of the clinical outcomes in routine evaluation outcome measure (CORE-OM). *Clinical Psychology and Psychotherapy, 16,* 444-449. doi:10.1002/cpp.646.

Perry, M., O'hara, K., Sellen, A., Brown, B. & Harper, R. (2001). Dealing with mobility: Understanding access anytime, anywhere. *ACM Transactions on Computer-Human Interaction*, *8*, 323-347. doi:10.1145/504704.504707.

Pino, M. J., Herruzo, J., Raya, A., Ruiz-Olivares, R. & Herruzo, C. (2020). Development of IAT-12, a reduced Spanish version of the Internet Addiction Test. *Current Psychology.* doi:10.1007/s12144-020-01167-4.

Ruiz-Olivares, R., Lucena, V. Pino, M. J. & Herruzo, J. (2010). Análisis de comportamientos relacionados con el uso/abuso de internet, teléfono móvil, compras y juego en estudiantes universitarios. *Adicciones*, *22*, 301-310. doi:10.20882/adicciones.171.

Simpson, C. G., Rose, C. A. & Ellis, S. K. (2016). Gender discrepancies and victimization of students with disabilities. *Remedial and Special Education*, *37*, 296-307. doi:10.1177/0741932516646082.

Söderström, S. (2009). The digital town square: Information and communication technology as an opportunity and a barrier to social relations for disabled youth. In: C. A. Marshall, E. Kendall, M. E. Banks & R. M. S. Gover (Eds.), *Disabilities: Insights from across fields and around the world, vol 2: The context: Environmental, social, and cultural considerations; disabilities: Insights from across fields and around the world* (pp. 61-80, Chapter XXII, 331 Pages). Santa Barbara, CA: Praeger/ABC-CLIO.

Söderström, S. (2011). Staying safe while on the move: Exploring differences in disabled and non-disabled young people's perceptions of the mobile phone's significance in daily life. *Young, 19*, 91-109. doi:10.1177%2F110330881001900106.

Spada, M. M. (2014). An overview of problematic internet use. *Addictive Behaviors*, *39*, 3-6. doi:10.1016/j.addbeh.2013.09.007.

Suriá, R. (2012a). La discapacidad en nuestros jóvenes, ¿fomenta las relaciones normalizadas a través de las redes sociales online o les hace adictos a ellas? *Revista Electrónica de Tecnología Educativa*, *41*, 1-17.

Suriá, R. (2012b). Redes sociales online y su utilización para mejorar las habilidades sociales en jóvenes con discapacidad. *Escritos de Psicología*, *5*, 16-23. doi:10.5231/psy.writ.2012.1809.

Suriá, R. (2015). Disability in young people, increases the risk of excessive internet use? *Health and Addictions*, *15*, 15-24.

Trujillo, A., Feixas, G., Bados, A., García-Grau, E., Salla, M., Medina, J…. Evans, C. (2016). Psychometric properties of the Spanish version of the Clinical Outcomes in Routine Evaluation – Outcome Measure. *Neuropsychiatric Disease and Treatment, 12,* 1457. doi:10.2147/NDT.S103079.

World Health Organization (2019). International Classification of Diseases. Retrieved at https://icd.who.int/browse11/l-m/en.

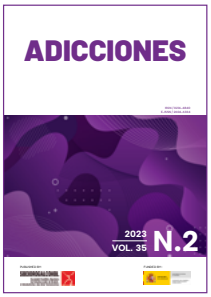
Young, K. S. (1998). Internet addiction: The emergence of a new clinical disorder. *Cyberpsychology and Behavior, 1*, 237–244. doi:10.1089/cpb.1998.1.237.

Young, K. S. (2011). Clinical assessment of internet-addicted clients. In: K. Young & C. Abreu (Eds.), *Internet addiction: A handbook and guide to evaluation and treatment* (pp. 19–34). New Jersey: John Wiley & Sons.

Zhou, Y., Li, D., Li, X., Wang, Y. & Zhao, L. (2017). Big five personality and adolescent internet addiction: The mediating role of coping style. *Addictive Behaviors, 64*, 42-48. doi:10.1016/j.addbeh.2016.08.009.

SOCIDROGALCOHOL
Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y las otras Toxicomanías

ADICCIONES
2023 ■ VOL. 35 ■ N. 2 ■ PAGES 185–196
www.adicciones.es



REVIEW

Smoking-attributable mortality in Spain: A systematic review

Mortalidad atribuida al consumo de tabaco en España: Revisión sistemática

Julia Rey-Brandariz*, Mónica Pérez-Ríos*,**, Maria Isolina Santiago-Pérez***, Leonor Varela-Lema*,****, Alexandra Giraldo-Osorio*, *****, ******, Nerea Mourino*, Alberto Ruano-Ravina *, **.

This article is part of the doctoral thesis of Julia Rey Brandariz.

*Área de Medicina Preventiva y Salud Pública, Universidad de Santiago de Compostela, Santiago de Compostela, España.

**CIBER de Epidemiología y Salud Pública, CIBERESP.

***Servicio de Epidemiología. Dirección General de Salud Pública. Xunta de Galicia, Santiago de Compostela, España.

****Unidad de Asesoramiento Científico-Técnico, Agencia Gallega de Conocimiento en Salud (avalia-t, ACIS), Santiago de Compostela, España.

*****Departamento de Salud Pública, Grupo de Investigación Promoción de la Salud y Prevención de la Enfermedad (GIPSPE), Universidad de Caldas, Manizales, Colombia.

******Fundación Carolina, Madrid, España.

******Fundación Carolina, Madrid, España.

Abstract

Smoking-attributable mortality (SAM) is an indicator that reflects the evolution of the tobacco epidemic at the population level. The objective of this study is to identify and to describe published studies that have estimated SAM in Spain. A search in PubMed and EMBASE databases was performed, limited to studies published until April 15th, 2021. Studies that estimated SAM in Spain or its constituent regions were included. Of the 146 studies identified, 22 met eligibility criteria. The first estimate of SAM in Spain dates from 1978 and the last from 2017. Twelve of the studies found estimated SAM at national level, 8 in regions, 1 in a province and 1 in a city. Most estimates were made for adults aged over 34, categorized as smokers, ex-smokers and never smokers. Observed mortality derived, in all studies, from official records, and relative risks mostly from Cancer Prevention Study II. In the period analyzed, a decrease in the burden of SAM was observed. In Spain, different SAM estimates are available globally, but they do not have regular periodicity, and such estimates are infrequently made by region. Due to variations in methodology and data sources, it is difficult to assess changes in SAM. Having global and regional periodic estimates would be necessary to correctly monitor the tobacco epidemic in Spain.

Key words: death, smoking, Spain

Resumen

La mortalidad atribuida (MA) al consumo de tabaco es un indicador que refleja la evolución de la epidemia tabáquica a nivel poblacional. El objetivo de este trabajo es identificar y describir los estudios publicados que hayan estimado MA al consumo de tabaco en España. Se realizó una búsqueda en las bases de datos de PubMed y EMBASE de los trabajos publicados hasta el 15/04/2021. Se incluyeron estudios que estimaron MA en España en su conjunto o en unidades territoriales. Se identificaron 146 estudios y 22 cumplieron los criterios de elegibilidad. La primera estimación de MA en España data de 1978 y la última de 2017. En 12 estudios se estimó la MA a nivel nacional, 8 en comunidades autónomas, 1 a nivel provincial y 1 en una ciudad. La mayoría de estimaciones se realizaron en adultos mayores de 34 años categorizados como fumadores, exfumadores y nunca fumadores. La mortalidad observada derivó en todos los estudios de registros oficiales y los riesgos relativos mayoritariamente del *Cancer Prevention Study II*. En el periodo analizado se observó una disminución en la carga de MA en relación con la mortalidad total. En España se dispone de estimaciones de MA a nivel global, pero no tienen periodicidad regular y es infrecuente que se realicen en unidades territoriales. Debido a variaciones en la metodología y en las fuentes de datos es difícil evaluar de forma precisa cambios en la MA. Sería necesario disponer de estimaciones periódicas globales y regionales para monitorizar correctamente la epidemia tabáquica en España.

Palabras clave: mortalidad/fumar, tabaco, España, mortalidad

■ *Received: August 2020; Accepted: April 2021.*

■ ISSN: 0214-4840 / E-ISSN: 2604-6334

■ **Send correspondence to:**
Mónica Pérez Ríos. Departamento de Medicina Preventiva y Salud Pública, Universidad de Santiago de Compostela, Santiago de Compostela, España. Telephone-fax: 0034881812277. Email: monica.perez.rios@usc.es

Smoking is the leading cause of preventable death worldwide due to its high prevalence and strength of association with different causes of death (U.S. Department of Health and Human Services, 2014). In Spain, 28.2% of men and 20.8% of women aged 16 and over were smokers in 2017 (Ministerio de Sanidad, Consumo y Bienestar, 2018). According to data from Spain's National Institute of Statistics (INE), diseases of the circulatory system, tumours and respiratory diseases were the main causes of death in Spain in 2018; these large groups of causes of death are all associated with smoking (Instituto Nacional de Estadística, 2018).

Against this background, the World Health Organization (WHO) has developed strategies such as MPOWER (Monitor, Protect, Offer, Warn, Enforce, Raise) and agreements such as the "WHO Framework Convention for tobacco control" for the purpose of building alliances between countries to develop policies, mobilize resources and plan interventions to reduce smoking. One of the strategies implemented in MPOWER is monitoring, understood as the observation of indicators that allow the development of the tobacco epidemic in the population to be described (World Health Organization, 2008).

The tobacco epidemic can be monitored using a variety of indicators. One of them is smoking-attributable mortality (SAM), which makes it possible to analyze the development of the tobacco epidemic and the impact it has on the health of populations in a simple and objective way through the application of different estimation methods (Pérez-Ríos & Montes, 2008). In addition, calculating SAM allows comparisons to be made of the impact of smoking across geographical areas, age groups or different smoking-attributable diseases.

Studies have been published in Spain that estimate the impact of smoking on population mortality. These studies vary in their geographic scope, publication date, and methodology. A review of all information available to date on the burden of smoking on mortality in Spain and/or its constituent regions is essential for a comprehensive view of its impact on the Spanish population and to understand how it has developed over time. The aim of this review is to identify and describe these studies.

Methods

The search methodology followed PRISMA guidelines (*Preferred Reporting Items for Systematic reviews and Meta-Analyses*) (Page et al., 2021; Rethlefsen et al., 2021).

Literature search

A search was carried out in the MEDLINE (PubMed) and EMBASE databases using the search strategy (((mortality) AND attribut*) AND (smok* OR tobacco)) AND (Spain OR name of the autonomous communities and cities). In the EMBASE database, the search was filtered by title, abstract, and keywords. Duplicates were removed manually. The search was completed with a manual check using metasearch engines such as Google Scholar and with a bibliography review of studies meeting the selection criteria.

The search was conducted on June 1, 2020, and updated on April 15, 2021. An alert was set in PubMed for weekly updates of new literature up to that date. The systematic review was registered in the PROSPERO database (Rey-Brandariz et al., 2021).

Inclusion criteria

All studies estimating SAM in Spain and published before April 15, 2021 were included, regardless of the estimation method used, whether covering the whole country or a smaller constituent area such as autonomous community (AC), province or city. Reports, conference contributions, simulation studies, studies not making estimates in the general population, joint estimates with other risk factors, re-analysis of SAM, studies exclusively estimating potential years of life lost (PYLL), analyzing morbidity or performing projections were not included. The search was not limited by language.

Study selection and information extraction

Two investigators (JRB and AGO) independently reviewed the titles and abstracts of the studies found. Those preselected by both were obtained and read in full. The information of the studies meeting inclusion criteria was extracted in a database designed for the purpose. The information extracted from each study was: year and journal of publication; regarding SAM: geographic scope (location for which the estimate was made), temporal scope (year/s of estimates), ages studied, age groups for which SAM was estimated and estimation method used; regarding smoking prevalence: data source, year of the study from which the prevalence was derived, categories of smoker included (smoker, ex-smoker, never smoker) and age groups; regarding relative risk (RR): data source; and regarding observed mortality (OM): data source, year of mortality and causes analyzed. Information was extracted on the percentages of attributable mortality (AM) versus OM in global, in men and in women; the cause of death group (tumours, cardiovascular/cardiometabolic and respiratory diseases) and the specific cause of death with the highest burden of SAM in both sexes, in men and in women. Differences in the data extracted by the two researchers (JRB and AGO) were resolved by consensus.

Results

Search results

Of the 146 studies found, 22 met the inclusion criteria. The EMBASE search provided 13 unidentified papers in the PubMed search, of which one met the inclusion criteria. The bibliography review of the studies included provided two further papers and the Google Scholar search did not return any studies on older adults. Thirty-four potentially relevant papers were identified and of these, 12 were excluded on reading the full text. The reasons for exclusion were that the estimates were made in a specific population (working-age population: 35-64 years) (Olivia-Moreno, Trapero-Bertran & Peña-Longobardo, 2019), the estimate was combined with other risk factors (Janssen, Trias-Llimós & Kunst, 2021), the study involved a reanalysis of SAM calculated in previous studies (Haeberer et al., 2020), did not attribute mortality (Gregoraci et al., 2017; Kulik et al., 2014; Long et al., 2021; Mackenbach et al., 2015, Rodríguez Tapioles, Pueyos Sánchez, Bueno Cavanillas, Delgado Rodríguez & Gálvez Vargas, 1994), estimated PYLL (García Benavides & Hernández Aguado, 1989), analyzed morbidity (González-Enríquez et al., 2002) or involved projections (Banegas Banegas et al., 1993; Sánchez et al., 2010). The study selection process is reflected in Figure 1, and Table 1 describes the main characteristics of the studies included.

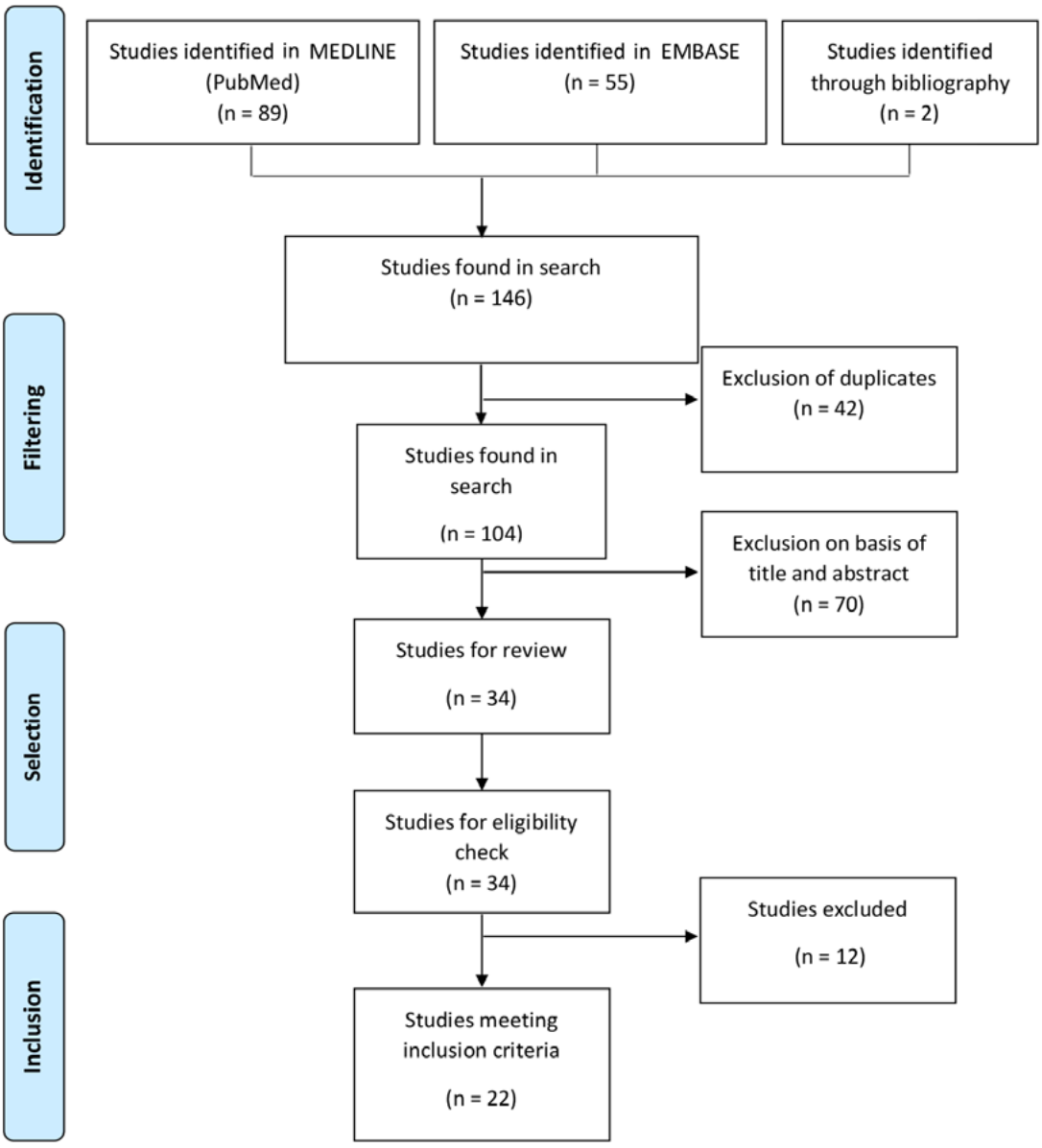


Figure 1. **Flow chart of literature search.**

Characteristics of the studies included

Regarding the studies included, 12 made estimates of SAM at the national level (Banegas et al., 2011; Banegas, Díez Gañán, González Enríquez, Villar Álvarez & Rodriguez-Artalejo, 2005; Banegas, Díez Gañán, Rodríguez-Artalejo, Pérez-Regadera & Villar Álvarez, 2001; Banegas, Rodríguez-Artalejo, Graciani, Billar & Herruzo, 2003; González Enríquez, Rodríguez Artalejo, Banegas Banegas & Villar Álvarez, 1989a; González Enríquez, Rodríguez Artalejo, Martín Moreno, Banegas Banegas & Villar Álvarez, 1989b; González Enríquez, Villar Álvarez, Banegas Banegas, Rodríguez Artalejo & Martín Moreno, 1997; Gutiérrez-Abejón et al., 2015; Hernández-García, Sáenz-González & González-Celador, 2010; Montes, Pérez-Ríos & Gestal, 2004; Pérez-Ríos et al., 2020; Rey et al., 2022), eight in autonomous communities (Bello Luján, Lorenzo Ruano, Gil Muñoz, Saavedra Santana & Serra Majem, 2001; Criado-Álvarez, Morant Ginestar & De Lucas Veguillas, 2002; Pérez Ríos et al,. 2009; Pérez Ríos et al., 2011; Santana Armas, Orengo, Santana Armas, Lorenzo & Serra Majem, 1998; Santos Zarza, Valero Juan & Sáenz González, 2001; Valero Juan, Carrero Santos, Nelia Lubián & Sáenz González, 1999; Zorrilla-Torras, García-Marín, Galán-Labaca & Gandarillas-Grande, 2005), one in a province (Granada) (Rodríguez Tapioles et al., 1997) and one in a city (Barcelona) (Jané, Borrell, Nebot & Pasarín, 2003). At the national level, estimates were made for the period 1978-1992, for the years 1983, 1984, 1998, 2012, 2016 and 2017, and twice for 2001 and 2006. Galicia and the Canary Islands were the autonomous communities with the highest SAM estimates.

The prevalence-dependent method was used to estimate SAM in all studies, except for one study carried out in Galicia which used the prevalence-independent method. Regarding study population age, 15 analyses were carried out in adults aged 35 years and over, four in the population aged 15/18 years and over, and three studies failed to indicate age. In 20 of the 21 studies using the prevalence-dependent method, prevalence data came from national or local surveys and 15 studies included three smoker categories: smokers, ex-smokers and never smokers. OM in all studies was taken from official registers, and in 16 of the 22 studies, RR was taken from Cancer Prevention Study II (CPS-II) (Table 1).

In 15 studies, AM was estimated for more causes of death than those causally linked to smoking by the Surgeon General's reference report for the year of estimation and in four, mortality was attributed to causes with an established causal relationship to smoking at the time of estimation (Table 1).

In all studies, the attribution of mortality focused on smoking, with the exception of two studies: one carried out in Barcelona (Jané et al., 2003) in which AM was also estimated for alcohol use and another at national level in which AM was also estimated for blood pressure, overweight/obesity and diabetes (Banegas et al, 2003).

Results of the estimation of smoking-attributable deaths

In 1978, it was estimated that 13.7% of the deaths observed at the national level were attributable to smoking (González Enríquez et al., 1997). This percentage rose to 16.0% in 1998 (Banegas et al., 2001), remained at approximately 15%-16% until 2012 (Gutiérrez Abejón et al., 2015) and fell to 13.7% in 2016 (Pérez Ríos et al., 2020). By AC, the proportion of AM versus OM was 9.4% in Castilla y León in 1995 (Santos Zarza et al., 2001) and 11.7% in Extremadura in 1993 (Valero Juan et al., 1999). In the estimate made in 2017, AM increased in both autonomous communities to 11.3% and 13.6%, respectively (Rey et al., 2022). In the Canary Islands, the percentage of AM reached 20.7% in 1975, fell to 15.3% in 1994 (Bello Luján et al., 2001) and remained stable in 2017 (15.3%) (Rey et al., 2022). The estimates for Castilla La Mancha were 18.7% in 1987 and 1997 (Criado Álvarez et al., 2002) and 12.4% in 2017 (Rey et al., 2022).

In men, it was estimated that SAM accounted for 20.3% of the total OM in 1983 (González Enríquez et al., 1989a), increased to 28.3% in 1998 (Banegas et al., 2001) and decreased after 2001 (Banegas et al., 2005), reaching 22.6% in 2012 (Gutiérrez Abejón et al., 2015). In women, the percentage of SAM compared to the total OM was 5.4% in 1983 (González Enríquez et al., 1989a), approximately 2%-3% between 1992-2001 (Banegas et al., 2001; Banegas et al., 2005; González Enríquez et al., 1997; Montes et al., 2004) and increased to 7.8% in 2006 (Hernández García et al., 2010). The ratio of AM in men compared to women decreased over the years; thus, in 1998 it was 92.5% (Banegas et al., 2001), i.e., 92.5% of SAM occurred in men, 91.0% in 2001 (Banegas et al., 2005; Montes et al., 2004); and 84%-85% in 2016 and 2017 (Pérez Ríos et al., 2020; Rey et al., 2022).

In 1978, the first study to estimate SAM in Spain established that 51.4% of SAM had been due to cardiovascular/cardiometabolic diseases, which placed them as the group of causes with the highest burden of AM (González Enríquez et al., 1997). This percentage decreased to 30%-35% in the estimates made between 2001 and 2006 (Hernández-García et al., 2010; Montes et al., 2004), and 27.5% in the estimate made in 2017 (Rey et al., 2022). As from the 1990s, tumours became the main group of causes of SAM, with 50% of SAM caused by tumours in the latest estimates (Pérez-Ríos et al., 2020; Rey et al., 2022). The burden of respiratory diseases in SAM has remained stable at around 20%-23% from estimates in 1992 and 1998 (Banegas et al., 2001; González Enríquez

Table 1. ***Main characteristics of studies estimating smoking-attributable mortality (SAM) in Spain (at national, autonomous community, province, city levels), 1978-2017.***

Author	Area	Year AM estimated	Population age	Age groups for estimation	Prevalence			Relative Risk	Observed mortality			
					Year	Smoker category	Age groups	Source	Year	Year SGϕ	Causes not included¶	Additional causes¶
NATIONAL												
González Enríquez et al., 1989a	Spain	1983	–	–	1970-1979	–	–	Various studies	1983	1984	–	Asthma
González Enríquez et al., 1989b	Spain	1984	–	–	–	–	–	Various studies	1984	1984	–	Asthma
González Enríquez et al., 1997	Spain	1978-1992	≥ 35 years	35-44 / 45-64 / ≥ 65	1978-1992	Smoker, ex-smoker, never smoker	35-44 / 45-64 / ≥ 65	CPS II	1978-1992	1989	Other vascular†	Hypertensive disease, pneumonia and influenza and asthma
Banegas et al., 2001	Spain	1998	≥ 35 years	Not specified	1997	Smoker, ex-smoker, never smoker	35-64 / ≥ 65	CPS II	1998	1989	–	Tuberculosis, pneumonia and influenza and asthma
Banegas et al., 2003	Spain	–	≥ 35 years	–	1987	–	–	CPS II	1995-1999	1989	–	Hypertensive disease, tuberculosis pneumonia, influenza, and asthma
Montes et al., 2004	Spain	2001	≥ 35 years	Not specified	2001	Smoker, ex-smoker, never smoker	35-64 / ≥ 65	CPS II	2001	1989	–	Hypertensive disease, pneumonia and influenza
Banegas et al., 2005	Spain	2001	≥ 35 years	35-64 / ≥ 65	2001	Smoker, ex-smoker, never smoker	35-64 / ≥ 65	CPS II	2001	2004	–	Various §
Hernández García et al., 2010	Spain	2006	≥ 35 years	Not specified	2006	Smoker, ex-smoker, never smoker	35-64 / ≥ 65	CPS II	2006	1989	–	Hypertensive disease, pneumonia, influenza, tuberculosis and asthma
Banegas et al., 2011	Spain	2006	≥ 35 years	35-64 / ≥ 65	2006	Smoker, ex-smoker, never smoker	35-64 / ≥ 66	CPS II	2006	1989	–	Various §
Gutiérrez Abejón et al., 2015	Spain	2012	≥ 18 years	Not specified	2012	Smoker, ex-smoker, never smoker	18-34 / 35-64 / ≥ 65	CPS II	2012	1989	–	Hypertensive disease, pneumonia, influenza, tuberculosis and asthma
Pérez Ríos et al., 2020	Spain	2016	≥ 35 years	35-54 / 55-64 / 65-74 / ≥ 75	2014 and 2016	Smoker, ex-smoker, never smoker	35-54 / 55-64 / 65-74 / ≥ 75	5 cohorts**	2016	2014	–	–
Rey et al., 2022	Spain/ 17 ACs	2017	≥ 35 years	35-54 / 55-64 / 65-74 / ≥ 75	2011,2014 and 2016	Smoker, ex-smoker, never smoker	35-54 /55-64 / 65-74 / ≥ 75	5 cohorts**	2017	2014	–	–
AUTONOMOUS COMMUNITY, PROVINCE, CITY												
Rodríguez Tapioles et al., 1997	Granada	1985	≥ 15 years	≤ 45 / 46-65 / 66-75 / ≥ 76	1990	–	–	Meta-analysis	1985	1989	Cervical cancer, rheumatic, cardiopulmonary diseases	–
Valero Juan et al., 1999	Extremadura	1993	≥ 15 years	–	1993	Smoker, ex-smoker, never smoker	–	Granada study (Rodríguez Tapioles et al., 1994)	1993	1989	Rheumatic, cardiopulmonary diseases, aortic aneurysm, atherosclerosis and other vascular†	–
Bello Luján et al., 2001	Canary Isles	1975-1994	≥ 35 years	Not specified	1975-1994	Smoker, ex-smoker, never smoker	35-44 / 45-64 / ≥ 65	CPS II	1975-1994	1989	–	Hypertensive disease, pneumonia, influenza, tuberculosis and asthma

Table 1. ***(Cont.)***

Author	Area	Year AM estimated	Population age	Age groups for estimation	Prevalence			Relative Risk	Observed mortality			
					Year	Smoker category	Age groups	Source	Year	Year SGϕ	Causes not included¶	Additional causes¶
AUTONOMOUS COMMUNITY, PROVINCE, CITY												
Santana Armas et al., 1998	Canary Isles	1995	–	–	1995	–	–	CPS II	1995	1989	Rheumatic, cardiopulmonary diseases, aortic aneurysm, atherosclerosis and other vascular†	Hypertensive disease and asthma
Santos Zarza et al., 2001	Castilla y León	1995	≥ 15 years	–	1993	Smoker, ex-smoker, never smoker	–	Granada study (Rodríguez Tapioles et al., 1994)	1995	1989	Rheumatic, cardiopulmonary diseases, aortic aneurysm, atherosclerosis and other vascular†	–
Criado Álvarez et al., 2002	Castilla La Mancha	1987 and 1997	≥ 35 years	Not specified	1987and 1997	–	–	CPS II	1987 and 1997	1989	–	Hypertensive disease, pneumonia, influenza, tuberculosis and asthma
Jané et al., 2003	Barcelona	1983-1998	≥ 35 years	35-44 / 45-54 / 55-64 / 65-74 / ≥ 75	1983-1998	–	–	CPS II	1983-1998	1989	–	Hypertensive disease, pneumonia, influenza, and asthma
Zorrilla Torras et al., 2005	Madrid	1992-1998	≥ 35 years	35-64 / ≥ 65	1992-1998	Smoker, ex-smoker, never smoker	–	CPS II	–	1989	–	Hypertensive disease, pneumonia, influenza, tuberculosis and asthma
Pérez Ríos et al., 2009	Galicia	2001-2006	≥ 35 years	35-64 / ≥ 65	2001-2006	Smoker, ex-smoker, never smoker	35-64 / ≥ 65	CPS II	–	2004	–	–
Pérez Ríos et al., 2011	Galicia	1980-2007	≥ 35 years	35-64 / ≥ 65	Not applicable*	Not applicable*	Not applicable*	CPS II	1980-2007	2004	–	–

Note. CPS II: *Cancer Prevention Study* II, SG: *Surgeon General*.

ϕ Year of *Surgeon General's* report on which the study was based in terms of establishing causes of smoking related deaths.

¶ Included in relation to the causes established by the *Surgeon General*. Causes are deemed to be diseases with which a causal relationship has been established, and the latter correspond to individual nosological entities (e.g., stomach cancer) or code groups in the 10th International Classification of Diseases (ICD - 10) used by international convention (e.g., Lung refers to trachea, bronchi, and lung)

† "Other vascular" includes the following diseases according to ICD-10 codes: I72 (other types of aneurysm), I73 (other peripheral vascular diseases), I74 (embolism and arterial thrombosis), I75 (atheroembolism), I76 (septic arterial embolism), I77 (other disorders of arteries and arterioles), I78 (capillary disease).

§ Included by code CIE-10: C46.2, C45.7, C68, I10-I15, I52, I97-I98, R00.1, R00.8, R01.2, G45, G93.6, G93.8, G95.1, M30-M31, J20.9, J98.0, A15-A16, A48.1, B05.2, B90.9, J45-J46, J65

* Estimation method used: prevalence independent.

** The National Institutes of Health- American Association of Retired Persons Diet and Health Study, the American Cancer Society's CPS II Nutrition Cohort, the Women's Health Initiative, the Nurses' Health Study and the Health Professionals Follow-up Study.

et al., 1997) up to the most recent ones (Pérez-Ríos et al., 2020; Rey et al., 2022).

In relation to specific causes, lung cancer took the place of ischemic heart disease as the main specific cause of SAM in Spanish men in 1992 (González Enríquez et al., 1997). In women, it is worth noting that ischemic heart disease was first replaced by chronic obstructive pulmonary disease (COPD) in 1992 (González Enríquez et al., 1997) and the latter by lung cancer in 2006 (Banegas et al., 2011). Table 2 offers a detailed summary of the main results of all studies included.

Discussion

This study shows that AM estimates are not made periodically in Spain and that no comparable information is available to assess the impact of smoking at more disaggregated regional levels such as the autonomous communities. Despite data pointing to variations in the development of the tobacco epidemic in terms of prevalence across different Spanish regions, studies that estimate AM at a more regional, i.e., autonomous community, province or city level are scarce and do not allow conclusions to be drawn regarding impact on mortality.

Table 2. ***Percentages of smoking attributable mortality (SAM) over observed mortality and group of causes of death and specific cause of death with a higher burden of SAM. Data are presented in total (men and women), in men and in women.***

Author	Area	Year AM estimated	Percentage of AM			Group of cause of death with highest AM			Specific cause of death with highest AM		
			Total	Men	Women	Total	Men	Women	Total	Men	Women
NATIONAL											
González Enríquez et al., 1989a	Spain	1983	13.0%	20.3%	5.4%	CVD	CVD	CVD	Ischemic heart disease	Ischemic heart disease	Ischemic heart disease
González Enríquez et al., 1989b	Spain	1984	13.8%	–	–	CVD	CVD	CVD	Ischemic heart disease	Ischemic heart disease	Ischemic heart disease
González Enríquez et al., 1997	Spain	1978-1992	1978: 13.7% 1992: 14.7%	1992: 26.3%	1992: 2.0%	1978: CVD 1992: tumours	1978: CVD 1992: tumours	1978: CVD 1992: CVD	1978: ACV 1992: Lung cancer	1978: CVA 1992: Lung cancer	1978: CVA 1992: COPD
Banegas et al., 2001	Spain	1998	16.0%	28.3%	2.5%	Tumours	Tumours	CVD	Lung cancer	Lung cancer	COPD
Banegas et al., 2003	Spain	–	16.0%	–	–	Tumours	Tumours	CVD	Lung cancer	Lung cancer	COPD
Montes et al., 2004	Spain	2001	–	24.5%	2.6%	Tumours	Tumours	CVD	Lung cancer	Lung cancer	COPD
Banegas et al., 2005	Spain	2001	15.5%	27.1%	2.9%	Tumours	Tumours	CVD	Lung cancer	Lung cancer	COPD
Hernández García et al., 2010	Spain	2006	16.2%	23.9%	7.8%	Tumours	Tumours	CVD	Lung cancer	Lung cancer	Otras cardiopatías
Banegas et al., 2011	Spain	2006	14.7%	25.1%	3.4%	Tumours	Tumours	CVD	Lung cancer	Lung cancer	Lung cancer
Gutiérrez Abejón et al., 2015	Spain	2012	15.2%	22.6%	7.6%	Tumours	Tumours	CVD	Lung cancer	Lung cancer	Otras cardiopatías
Pérez Ríos et al., 2020	Spain	2016	13.7%	–	–	Tumours	Tumours	Tumours	Lung cancer	Lung cancer	Lung cancer
Rey et al., 2022	Spain/ 17 ACs	2017	12.9%	–	–	Tumours	Tumours	Tumours	Lung cancer	Lung cancer	Lung cancer
AUTONOMOUS COMMUNITY, PROVINCE, CITY											
Rodríguez Tapioles et al., 1997	Granada	1985	15.9%	21.2%	10.0%	CVD	CVD	CVD	Ischemic heart disease	COPD	Ischemic heart disease
Valero Juan et al., 1999	Extremadura	1993	11.7%	16.8%	6.3%	Tumours	Tumours	CVD	Lung cancer	Lung cancer	CVA
Bello Luján et al., 2001	Canary Isles	1975-1994	1975: 20.0% 1994: 15.3%	–	–	1975: CVD 1994: CVD	1975: ECV 1994: ECV	1975: CVD 1994: CVD	1975: ACV 1994: Ischemic heart disease	1975: CVA 1994: Lung cancer	1975: CVA 1994: Ischemic heart disease
Santana Armas et al., 1998	Canary Isles	1995	14.9%	20.2%	8.0%	Tumours	–	–	Lung cancer	Lung cancer	Lung cancer
Santos Zarza et al., 2001	Castilla y León	1995	9.4%	7.2%	2.3%	CVD	CVD	CVD	Lung cancer	Lung cancer	Ischemic heart disease
Criado Álvarez et al., 2002	Castilla La Mancha	1987and 1997	1987: 18.7% 1997: 18.7%	1987: 14.2% 1997: 15.0%	1987: 4.5% 1997: 3.8%	1987: ECV 1997: ECV	–	–	1987: ACV 1997: Lung cancer	1987: Lung cancer 1997: Lung cancer	1987: Other heart diseases 1997: Other heart diseases
Jané et al., 2003	Barcelona	1983-1998	1983: 9.6% 1998: 13.8%	1998: 25.1%	1998: 2.9%	1983: CVD 1998: Tumours	1983: CVD 1998: Tumours	1983: CVD 1998: CVD	1998: Lung cancer	Lung cancer	COPD
Zorrilla Torras et al., 2005	Madrid	1992-1998	1998: 15.9%	1998: 28.4%	1998: 2.8%	1998: Tumours	1998: Tumours	1998: CVD	1998: Lung cancer	1998: Lung cancer	1998: Lung cancer
Pérez Ríos et al., 2009	Galicia	2001-2006	12.5%	22.4%	2.2%	Tumours	Tumours	Tumours	Lung cancer	Lung cancer	COPD
Pérez Ríos et al., 2011	Galicia	1980-2007	12.6%	23.5%	1.5%	Tumours	Tumours	CVD and respiratory disease	Lung cancer	Lung cancer	–

Note. AM: attributed mortality. COPD: chronic obstructive pulmonary disease. CVA: cerebrovascular accident. CVD: cardiovascular disease.

All studies estimating SAM in Spain use OM data taken from the cause of death statistics recorded by the INE; however, these do not always include all the pathologies with an established causal relationship with smoking at the time of estimation in the Surgeon General's reports. The Surgeon General has published four main reports assessing the status of causal links between smoking and mortality. The first, published in 1964, established a causal relationship with lung and laryngeal cancer in men and chronic bronchitis (U.S. Department of Health, Education and Welfare 1964). The second report, published in 1989, included causal relationships with various tumours (lung and larynx in both sexes, lip, oral cavity, pharynx, oesophagus, pancreas, cervix, bladder, kidney and renal pelvis); cardiovascular diseases (ischemic heart disease, cerebrovascular disease, rheumatic heart disease, cardiopulmonary disease, atherosclerosis, aortic aneurysm and other vascular diseases (classified as I72-I78 in ICD-10)) (U.S. Department of Health and Human Services, 1989). The third report, published in 2004, added causal relationships with stomach cancer, acute myeloid leukaemia, and pneumonia and influenza (U.S. Department of Health and Human Services, 2004). In the most recent report, published in 2014, new causal relationships with colorectal cancer, liver cell cancer, tuberculosis and diabetes mellitus were established. At present, different causes of death such as breast cancer continue to be studied (U.S. Department of Health and Human Services, 2014). Some of the estimation studies carried out in Spain failed to include all the pathologies with a causal relationship established at the time of research (González Enríquez et al., 1997; Rodriguez Tapioles et al., 1997; Santana Armas et al., 1998; Santos Zarza et al., 2001; Valero Juan et al., 1999) or included more causas (Banegas et al., 2001; Banegas et al., 2003; Banegas et al., 2005; Banegas et al., 2011; Bello Luján et al., 2001; Criado-Álvarez et al., 2002; González Enríquez et al., 1989a; González Enríquez et al., 1989b; González Enríquez et al., 1997; Gutiérrez-Abejón et al., 2015; Hernández-García et al., 2010; Jané et al., 2003; Montes et al., 2004; Santana Armas et al., 1998; Zorrilla-Torras et al., 2005). The latter may be due to the fact that several studies incorporated pathologies for which the available evidence suggested a possible link to smoking, although not enough evidence was available at the time to establish a causal relationship.

To date, the age at which mortality should be attributed to smoking has not been established, although most studies take 35 years as the lower limit. Estimating AM at an early age conflicts with the temporal precedence criterion of causality, according to which a risk factor causes illness or death after being exposed to it long enough to cause harm. This limitation can also be applied to prevalence data, since in several studies the prevalence used is close to OM in terms of time and does not take into account the time lapse between exposure and effect. Following methodological criteria, for example based on STROBE guidelines, would improve communication and standardize the publication of results and thus make it easier to carry out these analyses.

Since the first estimate of SAM in 1978, different studies conducted at the national level reflect an increase in the burden of SAM until 2001, when a decrease was observed for the first time in men. Direct comparison of estimates is complicated by differences across studies regarding changes in the age structure of the population from 1978 to 2017, the causes studied, or the risks used. Nevertheless, it can be highlighted that a comparison of SAM in men and women shows that SAM increased in the latter; in the latest estimates of 2016 and 2017, around 84%-85 % of deaths attributed to smoking occurred in men (Pérez-Ríos et al., 2020; Rey et al., 2022) compared to 96.6% observed in the first estimate in 1978 (González Enríquez et al., 1997). In countries such as the United States of America (USA) or the United Kingdom, where the tobacco epidemic has evolved further, the increase in SAM levels in women began to be observed decades before being seen in Spanish women. In the case of the United States, the impact of smoking on female mortality began to be detected towards the end of the 1950s, since when the figures for SAM increased until reaching the same level as those for men in the period 2005-2010 (Peto, Lopez, Boreham & Thun, 2011). In the case of the United Kingdom, the increase of SAM in women began before 1950 and, as in the United States, the percentage continued to rise until practically equalling that of men between 2005-2010 (Peto et al., 2011). In comparison to the United Kingdom and the United States, women in Spain started smoking later, and the decrease observed in the prevalence of smoking in men since 1987 was not observed in women until 2006. Thus, in the period 1987-2005, the absolute average annual decrease in the prevalence of male smokers was 1%, and 0.7% in the period 2006-2014. In women, the average annual decrease in the 2006-2014 period was 0.5% (Fernández et al., 2017). This means that men and women are in different stages of the tobacco epidemic model. Men are in stage IV, marked by the steady decline in the prevalence of smoking and AM among the population aged 35 to 69 years, and women could still be at late stage III, characterized by stabilizing prevalence and increased AM (Lopez, Collishaw & Piha, 1994; Thun, Peto, Boreham & Lopez, 2012).

Over the years, a decline has been observed in deaths from cardiovascular/cardiometabolic diseases attributed to smoking. This can be explained both by better control of the main risk factors for cardiovascular diseases, such as hypertension, hypercholesterolemia and sedentary lifestyle, as well as by the development of new medical treatments (Flores-Mateo et al., 2011). This decrease in AM to cardiovascular/cardiometabolic diseases means that

tumours are the group of causes with the greatest burden of mortality. To interpret these changes, it is necessary to consider the large differences in time elapsing between exposure to the risk factor and the outcome in these groups of diseases, which is much longer in the case of tumours than in cardiovascular/cardiometabolic diseases, where the effects are observed in a shorter period.

Regarding specific causes of death, it can be observed how lung cancer became the main cause of death in men due to smoking in the early 1990s (González Enríquez et al., 1997). In women, the increase in the number of deaths from lung cancer was slower, and the disease did not become the leading cause of smoking-related death in Spanish women until the latest estimates of 2016 and 2017, and those made in the five-year period 2010-2014 (Ministerio de Sanidad, Consumo & Bienestar Social, 2016; Pérez-Ríos et al., 2020; Rey et al., 2022). However, in countries like the USA and Canada, where women started smoking earlier, lung cancer was already the main cause of death in women in 1990 and 1991, respectively (Centers for Disease Control and Prevention, 1993; Illing & Kaiserman, 1995).

The most important limitation of this study is linked to the occasional difficulty in summarizing the information from the different studies included, given the heterogeneity in the presentation of results. The advantages are its systematic review design and thoroughness in the gathering of information.

In conclusion, there are different estimates in Spain of AM at the national level, but they are not regular in terms of the time periods involved. Although the tobacco epidemic is developing differently in terms of smoking prevalence across the constituent regions of Spain, there are few studies assessing the varying impact of smoking on mortality in smaller regional areas such as autonomous communities, provinces or cities. The age at which AM is estimated, and the data sources or the causes for which mortality is estimated are not homogeneous across the studies. Updating the causes of mortality linked to smoking, or smokers' and ex-smokers' current level of excess risk of death compared to that of never-smokers make it difficult to accurately assess the changes in the SAM estimates. In general, it can be affirmed that SAM increased in Spanish women from the first estimates to the most recent, while in men, it decreased after 2001. In Spain, lung cancer is currently the cause of death with the highest SAM in both sexes. Having periodic estimates at global and disaggregated levels, such as autonomous communities, would be necessary to correctly monitor the tobacco epidemic in Spain and assess the impact of the different tobacco control measures, both clinical and legislative, which have been implemented in Spain in recent years. Although this review shows that, overall, SAM is decreasing in Spain, the most recent estimates still have smoking as the risk factor that causes the greatest number of deaths. There is, therefore, an indisputable need to implement comprehensive tobacco control measures and primary and secondary prevention measures to enable progress towards a tobacco-free society.

Conflicts of interest

All authors declare no conflicts of interest.

References

Banegas, J. R., Díez-Gañán, L., Bañuelos-Marco, B., González-Enríquez, J., Villar-Álvarez, F., Martín-Moreno, J. M.,… Jiménez-Ruiz, C. (2011). Smoking-attributable deaths in Spain, 2006. *Medicina Clínica, 136*, 97-102. doi:10.1016/j.medcli.2010.03.039.

Banegas, J. R., Díez Gañán, L., González Enríquez, J., Villar Álvarez, F. & Rodríguez-Artalejo, F. (2005). La mortalidad atribuible al tabaquismo comienza a descender en España. *Medicina Clínica, 124*, 769-771. doi:10.1157/13075847.

Banegas, J. R. B., Díez Gañán, L., Rodríguez-Artalejo, F., Pérez-Regadera, A. G. & Villar Álvarez, F. (2001). Smoking-attributable deaths in Spain in 1998. *Medicina Clínica, 117*, 692-694. doi:10.1016/S0025-7753(01)72226-9.

Banegas, J. R., Rodríguez-Artalejo, F., Graciani, A., Villar, F. & Herruzo, R. (2003). Mortality attributable to cardiovascular risk factors in Spain. *European Journal of Clinical Nutrition, 57 (Supl. 1)*, S18–S21. doi:10.1038/sj.ejcn.1601804.

Banegas Banegas, J. R., Rodríguez Artalejo, F., Martín-Moreno, J. M., González Enríquez, J., Villar Alvarez, F. & Guasch Aguilar, A. (1993). Proyección del impacto del hábito tabáquico sobre la salud de la población española y de los beneficios potenciales de su control. *Medicina Clínica, 101*, 644–649.

Bello Luján, L., Lorenzo Ruano, P., Gil Muñoz, M., Saavedra Santana, P. & Serra Majem, L. (2001). Evolución de la mortalidad atribuible al tabaco en las Islas Canarias (1975-1994). *Revista Española de Salud Pública, 75*, 71-80.

Centers for Disease Control and Prevention. (1993). Cigarette smoking-attributable mortality and years of potential life lost--United States, 1990. *Morbidity and Mortality Weekly Report*, *42*, 645-649.

Criado-Álvarez, J. J., Morant Ginestar, C. & De Lucas Veguillas, A. (2002). Mortalidad atribuible al consumo de tabaco en los años 1987 y 1997 en Castilla La Mancha, España. *Revista Española de Salud Pública, 76*, 27-36.

Fernández, E., Fu, M., Galán, I., López-Medina, M. J., Martínez, C., Martínez-Sánchez, J. M.,… Sureda, F. (2017). *Evolución de las políticas de control de tabaquismo en España (Leyes 28/2005 y 42/2010). Revisión de la evidencia*. Retrieved at https://

www.seepidemiologia.es/documents/dummy/V9.0%20-%20Libro%20Tabaquismo%202017%20-%20Abierto%20Final.pdf.

Flores-Mateo, G., Grau, M., O'Flaherty, M., Ramos, R., Elosua, R., Violan-Fors, C.,… Capewell, S. (2011). Análisis de la disminución de la mortalidad por enfermedad coronaria en una población mediterránea: España 1988-2005. *Revista Española de Cardiología, 64*, 988-996. doi:10.1016/j.recesp.2011.05.033.

García Benavides, F. & Hernández Aguado, I. (1989). A propósito de la mortalidad prematura atribuible al tabaco. *Medicina Clínica, 93*, 274–275.

Gregoraci, G., van Lenthe, F. J., Artnik, B., Bopp, M., Deboosere, P., Kovács, K.,… DEMETRIQ Consortium (2017). Contribution of smoking to socioeconomic inequalities in mortality: A study of 14 European countries, 1990-2004. *Tobacco Control, 26*, 260–268. doi:10.1136/tobaccocontrol-2015-052766.

González Enríquez, J., Rodríguez Artalejo, F., Banegas Banegas, J. R. & Villar Álvarez, F. (1989a). Deaths attributed to tobacco consumption in Spain. Correcting and updating the data. *Medicina Clínica, 93*, 79.

González Enríquez, J., Rodríguez Artalejo, F., Martín Moreno, J., Banegas Banegas, J. R. & Villar Álvarez, F. (1989b). Deaths attributable to tobacco consumption in Spain. *Medicina Clínica, 92*, 15-18.

González Enríquez, J., Villar Álvarez, F., Banegas Banegas, J., Rodríguez Artalejo, F. & Martín Moreno, J. (1997). Trends in the mortality attributable to tobacco use in Spain, 1978-1992: 600,000 deaths in 15 years. *Medicina Clínica, 109*, 577-582.

González-Enríquez, J., Salvador-Llivina, T., López-Nicolás, A., Antón De Las Heras, E., Musin, A., Fernández, E. & Pérez-Escolano, I. (2002). Morbilidad, mortalidad y costes sanitarios evitables mediante una estrategia de tratamiento del tabaquismo en España. *Gaceta Sanitaria, 16*, 308–317. doi:10.1016/s0213-9111(02)71929-8.

Gutiérrez-Abejón, E., Rejas-Gutiérrez, J., Criado-Espegel, P., Campo-Ortega, E. P., Breñas-Villalón, M. T. & Martín-Sobrino, N. (2015). Smoking impact on mortality in Spain in 2012. *Medicina Clínica, 145*, 520-525. doi:10.1016/j.medcle.2016.04.018.

Haeberer, M., León-Gómez, I., Pérez-Gómez, B., Téllez-Plaza, M., Pérez-Ríos, M., Schiaffino, A.,… Galán, I. (2020). Social inequalities in tobacco-attributable mortality in Spain. The intersection between age, sex and educational level. *PloS One, 15*, e0239866. doi:10.1371/journal.pone.0239866.

Hernández-García, I., Sáenz-González, M. C. & González-Celador, R. (2010). Mortalidad atribuible al consumo de tabaco en España en el año 2006. *Anales del Sistema Sanitario de Navarra, 33*, 23-33. doi:10.4321/s1137-66272010000100003.

Illing, E. & Kaiserman, M. (1995). Mortality attributable to tobacco use in Canada and its regions, 1991. *Canadian Journal of Public Health, 86*, 257-265. doi:10.1093/PCH/6.2.70.

Instituto Nacional de Estadística. (2018). *Defunciones según la Causa de Muerte*. Retrieved at https://www.ine.es/jaxiT3/Tabla.htm?t=7947.

Jané, M., Borrell, C., Nebot, M. & Pasarín, M. I. (2003). Impact of smoking and alcohol consumption on mortality in the population of Barcelona [Spain]: 1983-1998. *Gaceta Sanitaria, 17*, 108-115. doi:10.1016/s0213-9111(03)71707-5.

Janssen, F., Trias-Llimós, S. & Kunst, A. E. (2021). The combined impact of smoking, obesity and alcohol on life-expectancy trends in Europe. *International Journal of Epidemiology, 50*, 931-941. doi:10.1093/ije/dyaa273.

Kulik, M. C., Menvielle, G., Eikemo, T. A., Bopp, M., Jasilionis, D., Kulhánová, I.,… EURO-GBD-SE Consortium (2014). Educational inequalities in three smoking-related causes of death in 18 European populations. *Nicotine and Tobacco Research, 16*, 507–518. doi:10.1093/ntr/ntt175.

Long, D., Mackenbach, J., Martikainen, P., Lundberg, O., Brønnum-Hansen, H., Bopp, M.,… Nusselder, W. (2021). Smoking and inequalities in mortality in 11 European countries: A birth cohort analysis. *Population Health Metrics, 19*, 3. doi:10.1186/s12963-021-00247-2.

Lopez, A. D., Collishaw, N. E. & Piha, T. (1994). A descriptive model of the cigarette epidemic in developed countries. *Tobacco Control, 3*, 242–247.

Mackenbach, J. P., Kulhánová, I., Menvielle, G., Bopp, M., Borrell, C., Costa, G.,… Eurothine and EURO-GBD-SE Consortiums (2015). Trends in inequalities in premature mortality: A study of 3.2 million deaths in 13 European countries. *Journal of Epidemiology and Community Health, 69*, 207–206. doi:10.1136/jech-2014-204319.

Ministerio de Sanidad, Consumo y Bienestar Social. (2016). *Muertes atribuibles al consumo de tabaco en España, 2000-2014*. Madrid: Ministerio de Sanidad, Consumo y Bienestar Social. Retrieved at https://www.mscbs.gob.es/estadEstudios/estadisticas/estadisticas/estMinisterio/mortalidad/docs/MuertesTabacoEspana2014.pdf.

Ministerio de Sanidad, Consumo y Bienestar Social. (2018). *Encuesta Nacional de Salud de España 2017*. Retrieved at https://www.mscbs.gob.es/estadEstudios/estadisticas/encuestaNacional/encuesta2017.htm.

Montes, A., Pérez-Ríos, M. & Gestal, J. (2004). Impacto del tabaquismo sobre la mortalidad en España. *Adicciones, 16*, 75-82.

Oliva-Moreno, J., Trapero-Bertran, M. & Peña-Longobardo, L. M. (2019). Gender differences in labour losses associated with smoking-related mortality. *International Journal of Environmental Research and Public Health, 16*, 3644. doi:10.3390/ijerph16193644.

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D.,… Moher, D. (2021). The PRISMA 2020 statement: An update guideline for reporting systematic reviews. *British Medical Journal, 372,* n71. doi:10.1136/bmj.n71.

Pérez-Ríos, M. & Montes, A. (2008). Methodologies used to estimate tobacco-attributable mortality: A review. *BMC Public Health, 8*, 22. doi:10.1186/1471-2458-8-22.

Pérez-Ríos, M., Santiago-Pérez, M. I., Caramés, S. C., De La Iglesia, B. A., Pintos, A. M. & Vidal, X. H. (2009). Mortalidad y años de esperanza de vida perdidos a causa del tabaquismo en personas mayores de 35 años en Galicia en el período 2001-2006. *Revista Española de Salud Pública, 83*, 557-565. doi:10.1590/s1135-57272009000400007.

Pérez-Ríos, M., Santiago-Pérez, M. I., Cerdeira-Caramés, S., Alonso, B., Seoane, B., Malvar-Pintos, A. & Hervada-Vidal, X. (2011). Mortality attributable to tobacco consumption in Galicia (Spain): 1980-2007. *Medicina Clínica, 137*, 247-253. doi:10.1016/j.medcli.2010.10.009.

Pérez-Ríos, M., Schiaffino, A., Montes, A., Fernández, E., López, M. J., Martínez-Sánchez, J. M.,… Galán, I. (2020). Smoking-attributable mortality in Spain in 2016. *Archivos de Bronconeumología, 56*, 559-563. doi:10.1016/j.arbres.2019.11.021.

Peto, R., Lopez, A.D., Boreham, J. & Thun, M. (2011). *Mortality from smoking in developed countries, 1950-2010.* Retrieved at https://tobaccocontrol.bmj.com/content/suppl/2012/02/22/tobaccocontrol-2011-050294.DC1/tobaccocontrol-2011-050294-s1.pdf.

Rethlefsen, M. L., Kirtley, S., Waffenschmidt, S., Ayala, A. P., Moher, D., Page, M. J. & Koffel, J. B. (2021). PRISMA-S: An extension to the PRISMA statement for reporting literature searches in systematic reviews. *Systematic Reviews, 10,* 39. doi:10.1186/s13643-020-01542-z.

Rey, J., Pérez-Ríos, M., Santiago-Pérez, M. I., Galán, I., Schiaffino, A., Varela-Lema, L.,… Ruano-Ravina, A. (2022). Mortalidad atribuida al consumo de tabaco en las comunidades autónomas de España, 2017. *Revista Española de Cardiología, 75,* 150-158. doi:10.1016/j.rec.2020.10.023.

Rey-Brandariz, J., Pérez-Ríos, M., Santiago-Pérez, M. I., Varela-Lema, L., Giraldo-Osorio, A., Mourino, N. & Ruano-Ravina, A. Attributable mortality to tobacco consumption in Spain: A systematic review. PROSPERO 2021 CRD42021240612. Retrieved at https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42021240612.

Rodríguez Tapioles, R., Bueno Cabanillas A, Pueyos Sánchez M, Espigares García, M., Martínez González, M. & Gálvez Vargas, R. (1997). Morbilidad, mortalidad y años potenciales de vida perdidos atribuibles al tabaco. *Medicina Clínica, 108,* 121-127.

Rodríguez Tapioles, R., Pueyos Sánchez, A., Bueno Cavanillas, A., Delgado Rodríguez, M. & Gálvez Vargas, R. (1994). Proportion of disease attributable to tobacco in the province of Granada. *Medicina Clínica, 102*, 571-574.

Sánchez, M. J., Payer, T., De Angelis, R., Larrañaga, N., Capocaccia, R., Martinez, C. & CIBERESP Working Group (2010). Cancer incidence and mortality in Spain: Estimates and projections for the period 1981-2012. *Annals of Oncology, 21 (Supl. 3),* iii30–iii36. doi:10.1093/annonc/mdq090.

Santana Armas, J., Orengo, J., Santana Armas, Y., Lorenzo, P. & Serra Majem, L. (1998). Mortalidad atribuible al tabaquismo en Canarias. *Canarias Médica, 13,* 15-19.

Santos Zarza, E. F., Valero Juan, L. F. & Sáenz González, M. C. (2001). Mortality attributable to smoking in Castilla and Leon. *Atención Primaria, 27,* 153-158. doi:10.1016/S0212-6567(01)78789-6.

Thun, M., Peto, R., Boreham, J. & Lopez, A. D. (2012). Stages of the cigarette epidemic on entering its second century. *Tobacco Control, 21*, 96–101. doi:10.1136/tobaccocontrol-2011-050294.

U. S. Department of Health, Education and Welfare. Smoking and Health. (1964). *Report of the Advisory Committee to Surgeon General of the Public Health Service.* Washington, DC: U. S. D. H. E. W., Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

U. S. Department of Health and Human Services. (1989). *The Health Consequences of Smoking: 25 Years of Progress. A Report of the Surgeon General*. Washington, DC: U. S. D. H. H. S., Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

U. S. Department of Health and Human Services. (2004). *The Health Consequences of Smoking: A Report of the Surgeon General*. Atlanta, GA: U. S. D. H. H. S., Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

U. S. Department of Health and Human Services. (2014). *The Health Consequences of Smoking: 50 Years of Progress. A Report of the Surgeon General*. Atlanta, GA.: U. S. D. H. H. S., Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

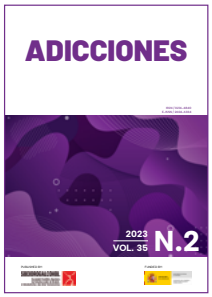
Valero Juan, L., Carrero Santos, M., Nelia Lubián, M. & Sáenz González, M. (1999). Mortalidad atribuible al tabaco en Extremadura. *Centro de Salud, 7*, 250-254.

World Health Organization. (2008). *OMS | MPOWER un plan de medidas para hacer retroceder la epidemia de tabaquismo.* Retrieved at http://www.who.int/tobacco/mpower/package/es/.

Zorrilla-Torras, B., García-Marín, N., Galán-Labaca, I. & Gandarillas-Grande, A. (2005). Smoking attributable mortality in the Community of Madrid: 1992-1998. *European Journal of Public Health, 15*, 43-50. doi:10.1093/eurpub/cki110.

SOCIDROGALCOHOL
Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y las otras Toxicomanías

ADICCIONES
2023 ■ VOL. 35 ■ N. 2 ■ PAGES 197–212
www.adicciones.es



REVIEW

Systematic review on the clinical management of chronic pain and comorbid opioid use disorder

Revisión sistemática sobre el manejo clínico del dolor crónico y el trastorno por uso de opioides simultáneo

Beltrán Jiménez-Fernández*, Cristina Calomarde-Gómez*, Ana López-Lazcano**, Anna Lligoña**, Antoni Gual**, Hugo López-Pelayo**.

* University of Barcelona. Faculty of Medicine. Barcelona. Spain.

** Grup Recerca Addiccions Clínic (GRAC-GRE), Institut d'Investigacions Biomèdiques August Pi I Sunyer (IDIBAPS), Hospital Clínic Barcelona, Barcelona. Spain.

Abstract

The crisis caused by prescribed opioids and their related side effects are a public health problem worldwide. Most of these are prescribed for coping with chronic pain. The coexistence of opioid use disorder (OUD) in patients with chronic pain represents a complex challenge due to the need for managing both pain and OUD. The aim of this systematic review is to evaluate the efficacy of feasible treatments for this population with OUD and comorbid chronic pain for both conditions. A systematic database search has been performed using Cochrane Library, MEDLINE, PsycINFO and ClinicalTrials.gov in compliance with PRISMA guidelines. Eligible articles addressed the outcomes in chronic pain patients with comorbid opioid use disorder after treatment interventions were applied. Of 593 identified articles, nine were eligible for qualitative review (n = 7 pharmacological interventions; n = 2 psychological interventions). Methadone, buprenorphine, cognitive-behavioral and mindfulness showed promising results, but data were inconclusive (<2 RCT with low risk of bias). It is unclear whether the opioid agonist treatment should be maintained or tapered and which drug should be prescribed for the opioid substitution therapy (methadone or buprenorphine/naloxone). Mindfulness and cognitive behavioral therapy have a discrete effect on improving negative affect but not pain. The therapeutic approach might be individualized under a shared decision-making basis.

Key words: opioid use disorder, chronic pain, methadone, buprenorphine, cognitive behavioral therapy

Resumen

La crisis causada por los opioides recetados y sus efectos secundarios relacionados son un problema de salud pública en todo el mundo. La mayoría de estos medicamentos se recetan para el afrontamiento del dolor crónico. La coexistencia del trastorno por uso de opioides (TUO) en pacientes con dolor crónico representa un desafío complejo debido a la necesidad de controlar tanto el dolor como el TUO. El objetivo de esta revisión sistemática es evaluar la eficacia de los tratamientos posibles para dicha población con TUO y dolor crónico. Se ha realizado una revisión sistemática usando las bases de datos Cochrane Library, MEDLINE, PsycINFO y ClinicalTrials.gov, conforme a las pautas PRISMA. Los artículos elegibles abordaron los resultados en pacientes con dolor crónico y diagnóstico comórbido de TUO, después de aplicar una intervención. De 593 artículos identificados, nueve eran elegibles para la revisión cualitativa (n = 7 intervenciones farmacológicas; n = 2 intervenciones psicológicas). La metadona, la buprenorfina, la terapia cognitivo-conductual y el mindfulness mostraron resultados prometedores, pero los datos no eran concluyentes (<2 ECA con bajo riesgo de sesgo). No está claro si el tratamiento con agonistas opioides debe mantenerse o disminuirse y qué fármaco debe prescribirse para la terapia de sustitución de opioides (metadona o buprenorfina/naloxona). El mindfulness y la terapia cognitivo-conductual tienen un efecto discreto en la mejora del afecto negativo, pero no del dolor. El enfoque terapéutico podría individualizarse sobre la base de una toma de decisiones conjunta.

Palabras clave: trastorno por uso de opioides, dolor crónico, metadona, buprenorfina, terapia cognitivo-conductual

■ *Received: April 2021; Accepted: December 2021.*

■ ISSN: 0214-4840 / E-ISSN: 2604-6334

■ **Send correspondence to:**
Ana Isabel López-Lazcano. C/Villaroel 170, 08036, Barcelona (España).
Email: ailopez@clinic.cat

Chronic pain (defined as "an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage" [International Association for the Study of Pain, 2020]) affects 25.3 million adults (11.2%) in America (Nahin, 2015). World Health Organization adds to the definition the length of symptom ("persists or recurs for longer than 3 months" [World Health Organization, 2019]). Between 5 and 8 million patients use opioids for chronic pain (National Institutes of Health, 2014). Opioid prescriptions for chronic non-cancer pain (CNCP) have increased drastically since 1999, especially in United States, country that consumes 80% of the global manufactured opioids (Brown & Sloan, 2017). Parallel to the increase of prescriptions, the rates of opioid use disorders (OUD) and overdoses have also increased (in 2015, drug overdoses deaths involving opioids were 33,091, 63% of overall drug overdose deaths) (Rudd, Seth, David & Scholl, 2016).

Whereas the usefulness of opioids for acute and cancer-related pain is well known (Wiffen, Wee, Derry, Bell & Moore, 2017), efficacy of opioids in CNCP is nowadays highly controverted. Long-term efficacy in controlling pain has failed to be demonstrated (Chou et al., 2015) and many patients discontinue long-term opioid therapy due to insufficient pain relief or adverse events (Noble et al., 2010). Regarding these adverse effects related to long-term opioid therapy in patients with CNCP the rate of opioid misuse has been estimated between 21% and 29% and the rate of opioid addiction between 8% and 12% (Vowles et al., 2015). Moreover, the absolute event rate for any adverse event with opioids is 78% whereas the absolute event rate of any serious event is 7.5% (Els et al., 2017). Guidelines regarding prescription of opioids and chronic pain (Busse et al., 2017; Dowell, Haegerich & Chou, 2016) discourage its use and, given the case, prescription must be the lowest effective dose (preferably ≤50 Morphine Milligram Equivalent Doses, MED) (Busse et al., 2017; Dowell et al., 2016). In patients with high opioid doses (≥90 MED/day), a tapering strategy is recommended, especially in those who have not reached enough pain relief (Busse et al., 2017; Dowell et al., 2016).

The Centers for Disease Control and Prevention (CDC) 2016's Guideline for Prescribing Opioids for Chronic Pain (Dowell et al., 2016) states in its 12th recommendation that "Clinicians should offer or arrange evidence-based treatment (usually medication-assisted treatment with buprenorphine or methadone in combination with behavioral therapies) for patients with opioid use disorder". The rationale is that tapering or discontinuing opioid medications could result in enhanced pain and craving with consequent use of illicit drugs and potential harms to the patient. On the other hand, continuing with opioid medication may increase tolerance, cause hyperalgesia, strengthen addiction and provoke a potentially harmful use. Maintenance of this equilibrium represents a big challenge.

Methadone is a synthetic μ-opioid agonist with a long half-life (5-55h) approved as analgesic and treatment of opioid use disorder. It is also an NMDA-receptor antagonist, meaning that it is useful for chronic neuropathic pain. Nevertheless, due to its complex non-linear pharmacokinetics, its potential serious adverse effects including cardiac events (QT prolongation, *torsade de pointes*, arrhythmias…), risk of overdose and minor events like sedation, constipation, nausea or dizziness, must be strictly monitored. Additionally, methadone's analgesic effects last 4-6h requiring multiple daily doses (Heinzerling, 2019). Buprenorphine is a μ-opioid partial agonist also approved as analgesic and treatment for opioid use disorder. It is usually combined with naloxone to deter intravenous use. Although oral absorption of naloxone is very low, it causes withdrawal symptoms if injected. It is also a κ-opioid receptor antagonist and may be able to reduce hyperalgesia. As a partial opioid agonist, it has ceiling effects and, therefore, a better safety profile compared to complete agonists like methadone (Heinzerling, 2019). Despite its safer profile, methadone retains longer in treatment patients with opioid use disorder than buprenorphine (Mattick, Breen, Kimber & Davoli, 2014). Psychological therapies are one of the main cornerstones of addiction treatments (Kampman & Jarvis, 2015). For example, cognitive behavioral therapy (CBT) has proven to be effective in substance use disorders (Dutra et al., 2008), to cope with chronic pain (Williams, Eccleston & Morley, 2012), even in patients with CNCP and substance use disorder (Ilgen et al., 2016). Research also supports the use of mindfulness-based interventions (MBIs) such as Mindfulness-Based Relapse Prevention (MBPR) (Bowen, Chawla & Marlatt, 2011), Mindfulness-Oriented Recovery Enhancement (MORE) (Garland et al., 2014), and Mindfulness-Based Addiction Treatment (MBAT) (Vidrine et al., 2016) for treating addictive behaviors (Garland & Howard, 2018; Li, Howard, Garland, McGoverns & Lazar, 2017), and has obtained higher rates of abstinence among people who use heroin (Chen et al., 2019). Mindfulness has also been found useful for reducing pain attentional bias in CNCP patients (Garland & Howard, 2013), and has reduced pain severity and desire for opioids in CNCP patients at risk of OUD (Garland et al., 2014).

Unfortunately, evidence of CDC 12th statement is extrapolated from studies regarding general OUD or OUD for prescribed opioids but none specifically for OUD in CNCP. The outcomes of these studies regarding pain relief do not specifically focus on this population. The aim of this work is to collect and analyze the most updated and based-on-evidence data on clinical management of both opioid use disorder and comorbid chronic pain in those patients suffering from both conditions, whether the proposed

therapies are pharmacological or non-pharmacological and focusing on those outcomes related to these two simultaneous conditions.

Methods

Data sources and search strategy

This study has been done following PRISMA's guidelines (Moher, Liberati, Tetzlaff & Altman, 2009). A previous protocol has been registered in PROSPERO (CRD42020198672). To write this systematic review, the investigators have searched articles related to CNCP and comorbid OUD focused on its clinical management, based on evidence. The combination of used terms, in English, is displayed in Figure 1. The chosen databases to perform the search were Cochrane Library, PsycINFO, MEDLINE and ClinicalTrials.gov because they are some of the most used databases and have a high acceptance (Murdoch University, 2021).

The search included articles from the date of inception of the databases to December 2019 and the search and selection process were performed from January 2020 to March 2020. The writing of the review was done between April and May 2020. Two investigators designed the search strategy, one investigator conduct the initial search and selection under the supervision of two other investigators and three investigators participated into the final process of selecting those articles to be included in the review. As only one investigator performed the initial search and selection, no inter-judge reliability could be assessed. The search was restricted to 1) human studies and 2) completed studies.

Inclusion and exclusion criteria

Methadone and buprenorphine are the only approved therapies for treating both coexistent conditions. With respect to the literature regarding the effectiveness of psychological interventions for treating chronic pain and increasing abstinence in OUD or reducing prescribed opioids, there is some preliminary evidence that CBT and mindfulness therapy may be useful but findings to date are mixed (Eccleston et al., 2017). On the other hand, naltrexone has not been included because, even though an analgesic effect has been described recently, the mechanism remains uncertain and its indication nowadays is only for treating OUD (and alcohol use disorders), not both conditions of interest at the same time.

Publications were eligible for inclusion if they were: (1) metanalysis or systematic reviews with a pharmacological or psychological intervention for treating comorbid CNCP and OUD; (2) randomized, controlled and/or double-blind clinical trials (RCT) with a pharmacological or psychological intervention for treating CNCP and comorbid OUD; (3) nonrandomized and observational studies examining the outcomes of patients treated with a pharmacological and/or psychological intervention for CNCP and comorbid OUD. Studies were excluded if they were: non-English nor Spanish written, without published results, narrative reviews, case reports, letters, editorials and animal or laboratory studies.

Regarding the PICO questions, investigators only were willing to include those articles that all their population had a diagnose for both CNCP and OUD, independently of the setting, the sex, age or other demographic characteristics; an active intervention (and comparator in RCT) had to be applied in those participants either pharmacological, methadone or buprenorphine/naloxone, or non-pharmacological, CBT or mindfulness; the primary and secondary outcomes had to be related with evolution of CNCP and/or evolution of the OUD after the intended intervention, as the purpose of the review is to assess the development of both conditions after the intervention. To consult the PICO questions and the rest of the included studies' characteristics, lector is referred to consult Tables 1, 2 and 3.

From a total of 593 articles meeting the search criteria, 7 duplicates were detected with Mendeley Reference Manager® software and were removed. 586 records were screened at the title and abstract and 30 full-text studies were assessed for eligibility. The systematic review flow diagram of this article is represented in Figure 2.

Assessment of methodological quality

The assessment of methodological quality has been focused on those studies with an RCT basis, as their level of evidence is higher. To do so, authors have assessed the methodological quality using the Rob 2 Cochrane risk of bias tool (Sterne et al., 2019).

1) < chronic pain >
2) AND < opiate > OR < opioid > OR < narcotic >
3) AND < addiction > OR < misuse > OR < disorder > OR < aberrant behavior > OR < abuse > OR < dependence >
4) AND < methadone > OR < buprenorphine > OR < cognitive behavioral therapy > OR < mindfulness >

Figure 1. **Combination of terms used to perform the literature search, in title, abstract and/or keywords.**

Table 1. *Summary of the pharmacological observational descriptive studies.*

Author, year	Participants' characteristics				Setting	Intervention	Primary Outcome	Other outcomes	Results
	OUD diagnosis	CNCP diagnosis	Number of participants (mean age)	% Male					
Rhodin et al. 2006	DSM-IV	Pain physician assessment and medical records.	n = 60 (43)	51.6	Outpatient methadone maintenance program in Sweden.	Oral MTD (mean dose 99.5mg, range 10-350mg) to treat OUD and CNCP in a pilot program (average treatment duration 38.3 months, range 1-94 months).	Evaluation of analgesia.	Evaluation of side effects, quality of life and identification of risk factors related to OUD in CNCP population.	For patients with a correct follow-up (48/60, 80%), 75% reported "good" pain relief and 25% "moderate". Most patients reported an improvement in their quality of life (mean 50.8, range 0-100). Common side effects were sedation, loss of energy, increase in weight, insomnia, sweating, weakness, sexual dysfunction and anorexia (>40%). Previous story of addiction or mental disorder was found as the main risk factor to develop OUD.
Pade et al. 2012	DSM-IV	Physical examination and medical records.	n = 143 (52)	93	Primary care setting for military veteran population in New Mexico, USA.	Sublingual BUP/NLX (mean dose of BUP 16mg, range 6-28mg).	Evaluation of analgesia compared to baseline.	Relapse during the 6 first months and retention on BUP/NLX treatment.	BUP/NLX decreased significantly ($p<0.001$) pain (mean 5.6; 95% CI 5.4 -5.8) compared to baseline (mean 6.39; 95% CI 6.2 - 6.6). 65% of the patients remained abstinent and on treatment for 6 months. 42% remained on BUP/NLX more than 6 months, 13% greater than one year and 3.5% more than 18 months.
Streltzer et al. 2015	DSM-IV	Pain clinic assessment and medical records.	n = 43 (50)	70	Outpatient psychiatric pain clinic in Hawaii, USA.	Sublingual BUP/NLX (median dose 8mg, range 0.25-32mg; median treatment duration 19 months, range 1-85 months).	Analysis of the evolution of patients through treatment course.	Differences between patients who had and had not a previous history of drugs and/or alcohol abuse regarding positive non-physiological pain (Waddell test [Waddell, McCulloch & Kummel, 1980]), more-than-one pain location, smoking habit, prescription of BNZ and rates of maintenance in treatment or detoxification.	During treatment, 10 patients returned to prescription opioids, drop out or were transferred to a licensed opioid treatment program (23%); 19 patients maintained treatment (44%); 3 patients successfully detoxed (7%); 3 patients transferred care (7%); 6 patients were lost to follow-up (14%); 2 patients died (4.7%), 1 from overdose. 35 patients (74%) remained in treatment more than 6 months. No significant differences were found between patients with and without previous history of alcohol/drugs abuse in positive non-physiological pain (100% vs. 72%), more than one pain location (53% vs. 61%), smoking habit (67% vs. 47%), prescription of BNZ (53% vs. 36%), and rate of maintenance in treatment or detoxification (47% vs. 54%).
Worley et al. 2017	DSM-IV	Patient self-report pain ≥3months and confirmation through medical screening.	n = 125 (no mean age specified).	52	Community clinics affiliated with a national clinical trial network (POATS) in 10 USA cities.	Tapering BUP/NLX (maximum range doses 8-32mg) for 4 weeks, continued by 8 weeks of follow-up.	Correlation between pain volatility during the tapering phase with the risk of relapse (assessed by self-referred use and urine drug screen).	Correlation between baseline pain and the degree of improvement in analgesia with the risk of relapse (assessed by self-referred use and urine drug screen).	Volatility of pain was found significantly correlated with positive drug screening (OR: 2.43; 95%CI 1.03-5.76; p = .04) and self-referred drug use (IRR: 1.66; 95%CI 1.20-2.58; p = .009). A lower degree of pain improvement was found significantly correlated with positive drug screening (2.38; 95%CI 1.13-5.02; p = .02) and self-referred drug use (IRR: 1.4; 95%CI 1.02-1.97; p = .04). Baseline pain was not significantly correlated with positive drug screening (OR: 1.13; p = .44) nor self-referred drug use (IRR: 1.16; p = .42).

Note. BNZ: benzodiazepines; BUP/NLX: buprenorphine/naloxone; CNCP: chronic non-cancerous pain; DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, 4th edition (American Psychiatric Association, 1993); IRR: incidence-rate ratio; MTD: methadone; OR: odds ratio; OUD: opioid use disorder; POATS: Prescription Opioid Addiction Treatment Study (Weiss et al., 2011); USA: United States of America.

Table 2. *Summary of the pharmacological open-label, controlled, randomized clinical trials.*

Author, year	Participants' characteristics				Setting	Intervention	Active comparator	Primary Outcome	Other outcomes	Results
	OUD diagnosis	CNCP diagnosis	Number of participants (mean age)	% Male						
Blondell et al. 2010	DSM-IV	Multi-disciplinary pain assessment and medical records.	n = 12 (45)	50	Outpatient clinics of a tertiary-care teaching hospital in New York State, USA.	3 sublingual tablets* of 2/0.5mg of BUP/NLX (steady dose) per day for 6 months.	3 sublingual tablets* of 2/0.5mg of BUP/NLX per day for one month, 2 for one month,1 for two months and none for two months (tapering dose).	Treatment retention at the completion of each protocol.	Number of days of licit or illicit drug use or alcohol determined by participant self-report or positive urine toxicology; initiation of and engagement in behavioral therapy or medical counseling.	5 out of 6 participants in the "steady dose" group completed the protocol compared to none out of 6 in the "tapering dose" group, which was found significant (p = .015), with a RR** of 0.1667 (95% CI 0.0278 – 0.9975; p = .0497). As none of the patients in the active comparator arm completed the protocol, secondary outcomes were not analyzed.
Neumann et al. 2013	DSM-IV-TR and DAST>4	Pain related to spine or large joint confirmed by diagnostic imaging and medical records.	n = 54 (38.3)	53.7	Outpatient primary care center in New York State, USA.	Sublingual BUP/NLX tablets 4/1-16/4mg (average dose14.93/3.73mg) per day divided 2-4 times daily for 6 months.	Oral MTD tablets20-60mg (average dose 29.09mg) per day divided 2-4 times daily for 6 months.	Self-reported analgesia at 6 months compared to the initial visit.	Treatment retention; self-reported functioning; self-reported drug and alcohol use.	The mean percent change of pain from baseline between BUP/NLX group (87.4, SD = 33.4) and MTD group (88.6, SD = 24.5) was not significant (p = .918); follow-up effect was revealed (p = .043) and across both treatments' participants reported less pain (mean = 5.5, SD = 1.9) than baseline (mean = 6.3, SD = 1.2) with a 12.75% reduction in pain at medium effect size (Cohen's d = 0.52). 26 participants (48.1%) completed the protocol, 13 in each arm, with no significant differences (p = .77). The mean percent change of functioning from baseline between BUP/NLX group (121.9, SD = 63.9) and MTD group (113.8, SD = 62.5) was not significant (p = .787). 5 participants in the BUP/NLX group referred use of opioids compared to none in the MTD group, which was found significant (p = .039). In BUP/NLX group 4 participants reported alcohol use compared to 2 in the MTD group, with no significant difference (p = .645).
Neumann et al. 2019 ***	DSM-IV-TR and DAST >4	Failed back surgery confirmed by physical examination or diagnostic imaging.	n = 19 (41.1)	31.6	Outpatient primary care center in New York State, USA.	Sublingual BUP/NLX tablets8/2-16/4mg per day divided 2-4 times daily for 6 months.	Oral MTD tablets 30-60mg per day divided 3-4 times daily for 6 months.	Self-reported analgesia.	Self-reported functioning; illicit drug use; depression; craving.	The mean pain severity among completers (10, 6 in MTD and 4 in BUP/NLX), measured by a VAS at 6 months was 71.8 (SD = 20.9) in the BUP/NLX group compared to 36.3 (SD = 22.4) in the MTD group, which showed no significant difference (p = .097). Functioning, measured by VAS, in the MTD group was 31.7 (SD = 25.1) compared to 71.3 (SD = 16.0) in the BUP/NLX group, which showed no significant differences (p = .088). Among completers, 1 participant in each arm had a positive urine test for opioids at the end of the protocol compared to 3 in BUP/NLX group and 4 in the MTD group at baseline. Depression, assessed with the BDI, scored 17.0 (SD = 18.2) in the MTD group compared to 15.3 (SD = 14.2) in the BUP/NLX, which showed no significant differences (p = .895). The mean measurement for craving among completers measured by a VAS at 6 months was 11.7 (SD = 18.1) in the MTD group compared to 27.2 (SD = 31.7) in the BUP/NLX group, with no significant difference (p = .348).

Note. BDI: Beck Depression Inventory (Beck, Ward, Mendelson, Mock & Erbaugh, 1961); BUP/NLX: buprenorphine/naloxone; CNCP: chronic non-cancerous pain; DAST: Drug Abuse Screening Test (Skinner, 1982); DSM-IV(-TR): Diagnostic and Statistical Manual of Mental Disorders, 4th edition (American Psychiatric Association, 1993) Text Revision (American Psychiatric Association, 2000); MTD: methadone; OUD: opioid use disorder; SD: standard derivation; USA: United States of America; VAS: visual analogue scale.

* Initial doses could be adjusted based on individual's response.

** RR was calculated by the reviewers with www.medcalc.org/calc/relative_risk.php.

*** Results have been extracted from those published in the protocol (National Library of Medicine US, 2019) when the original paper has provided them across both treatments instead of single treatments.

Table 3. *Summary of the non-pharmacological open-label, controlled, randomized clinical trials.*

Author, year	Participants' characteristics				Setting	Intervention	Active comparator	Primary Outcome	Other outcomes	Results
	OUD diagnosis	CNCP diagnosis	Number of participants (mean age)	% Male						
Barry et al. 2019*	DSM-IV-TR	Self-referred moderate-to-severe low back pain (≥4 NRS) over 6 months.	n = 40 (38.1)	62.5	Outpatient pain clinic in Connecticut, USA.	CBT (one 30-45 minutes weekly session) for 12 weeks.	MDC (four 15-20 minutes sessions) for 12 weeks.	Rates of abstinence compared to baseline; significant reductions in pain interference (≥2 points) from baseline.	Maximum consecutive weeks of abstinence; rates of significant reduction (≥2 points) in pain intensity from baseline.	The proportion of abstinent patients is significantly higher compared to baseline in the CBT group compared to MDC [Wald $\chi 2$ (1) = 5.47; p = .019]. No significant difference (≥2 points) was found in pain interference from baseline between CBT (42.9%) and MDC (42.1%) [$\chi 2$ (1,N) =40 = 0.002, p = .962]. The mean consecutive weeks of abstinence in the CBT group was 6.1 (SD = 4.2) and 3.9 (SD = 3.3), which was not significant (p = .06). Pain intensity from baseline in the CBT group was 14.3% and 15.8% in the MDT group, which was not found significant [$\chi 2$ (1,N) =40 = 0.018, p = .894].
Garland et al. 2019 **	Being in MMT for 3 months	CNCP ≥8 in Gracely Box Scale (Gracely & Kwilosz, 1988) for 2 months or longer.	n = 30 (50.4)	50	Outpatient methadone clinic in New Jersey, USA.	MORE in 8 sessions of group therapy intervention, 2 hours each week (participants were asked to practice 15 minutes of mindfulness every day).	MMT.	Craving.	Pain intensity; pain unpleasantness; stress; positive affect.	The MORE group reported 44% less craving than the MMT group, which was significant (Group X Time B= -0.019, SE= 0.005, p <.001). Pain intensity was not significant (p > .1). The MORE group reported 13% less pain unpleasantness than the MMT group, which was significant (Group X Time B= -0.007, SE = 0.003, p = .025). The MORE group reported 26% less stress than the MMT group, which was significant (Group X Time B= -0.014, SE= 0.004, p = .003). The MORE group reported 22% greater affect than the MMT group, which was significant (Group X Time B= -0.01, SE= 0.004, p = .017).

Note. BUP/NLX: buprenorphine-naloxone; CBT: cognitive behavioral therapy; CNCP: chronic non-cancerous pain; DSM-IV-TR: Diagnostic and Statistical Manual of Mental Disorders, 4th edition Text Revision (American Psychiatric Association, 2000); MDC: methadone drug counseling; MMT: methadone maintenance treatment; MORE: Mindfulness-Oriented Recovery Enhancement; MTD: methadone; NRS: numerical rating scale; SD: standard derivation; SE: standard error; USA: United States of America.

*This is a pilot study which its focus of interest are feasibility and acceptability. The outcomes are those considered as preliminary efficacy outcomes.
**The results are obtained from a ecological momentary assessment of a uncompleted clinical trial.

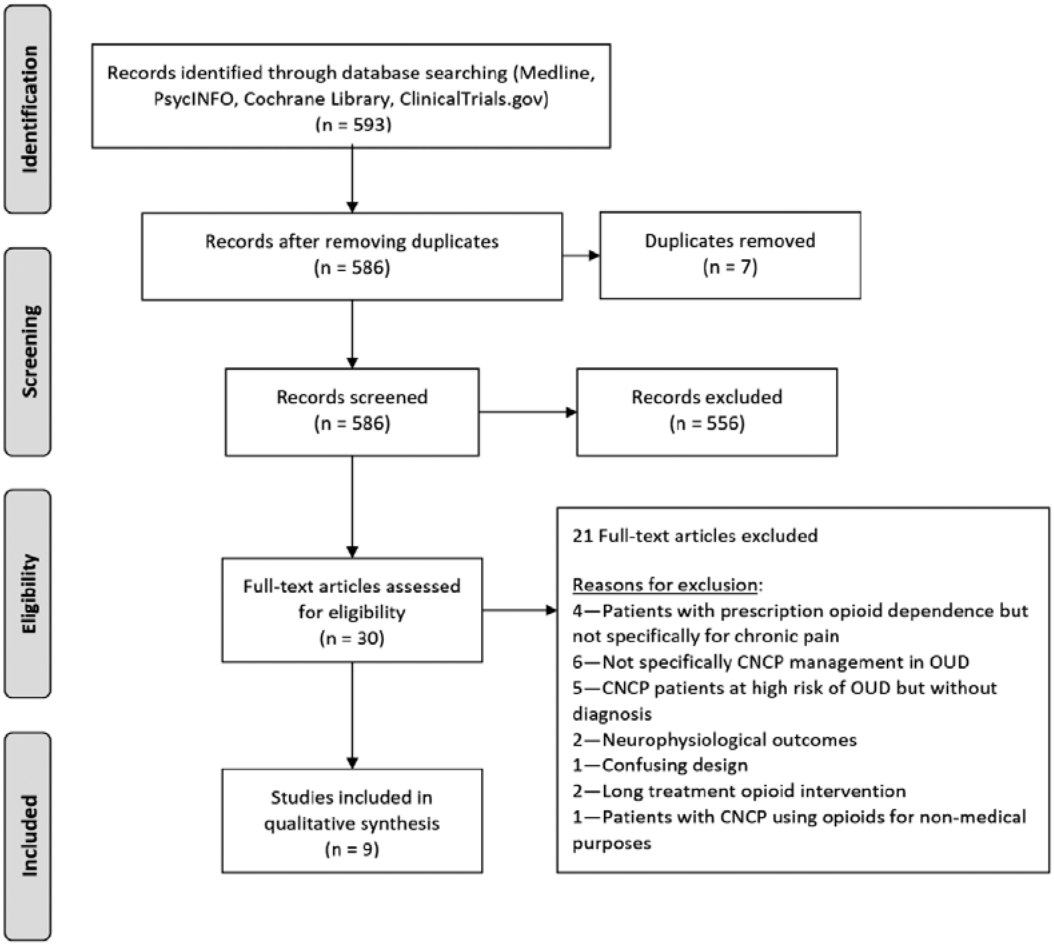


Figure 2. **Flow diagram of the literature search, inclusion process and reasons for exclusion after full-text assessment.**

Results

Nine studies were finally included in the qualitative synthesis. Five studies were RCTs and four were observational studies. The results of the studies have been organized according to whether the treatments are pharmacological or psychological. After full-text extraction, significant methodological differences among studies were noted, inhibiting the possibility of pooling the results of the outcomes to perform a quantitative analysis.

Pharmacological treatments

Methadone was studied in 1 observational study and 2 RCTs. The observational study reported that pain relief was "good" in 75% of participants and "moderate" in 25% (Rhodin, Grönbladh, Nilsson & Gordh, 2006). The 2 RCTs comparing effectiveness of methadone with buprenorphine/naloxone did not show significant differences in terms of analgesia and relapse (Neumann, Blondell, Hoopsick & Homish, 2019; Neumann et al., 2013).

Buprenorphine/naloxone was studied in 3 observational studies and 3 RCTs. 1 observational study reported a significant analgesic effect compared to baseline and a rate of abstinence for 6 months and retention on treatment of 65% (Pade, Cardon, Hoffman & Geppert, 2012) whereas 1 observational study reported a 74% of retention on treatment at 6 months (Streltzer, Davidson & Goebert, 2015). 1 observational study found a positive correlation during treatment with buprenorphine between a higher volatility of pain or a poorer improvement of it and opioid relapse (Worley, Heinzerling, Shoptaw & Ling, 2017). 1 RCT compared tapering doses with steady doses of buprenorphine/naloxone, reporting a relative risk of 0.17 (calculated for this systematic review) of not completing the treatment when doses were steady instead of tapered (Blondell et al., 2010). As previously noted, 2 RCT compared methadone with buprenorphine/naloxone. None of them could demonstrate significant differences between these treatments with regard to analgesia and rate of relapse (Neumann et al., 2013, 2019).

1 of the 2 RCTs that compared methadone with buprenorphine/naloxone, pointed out that, even though there were no significant differences, across both treatments

Supporting materials

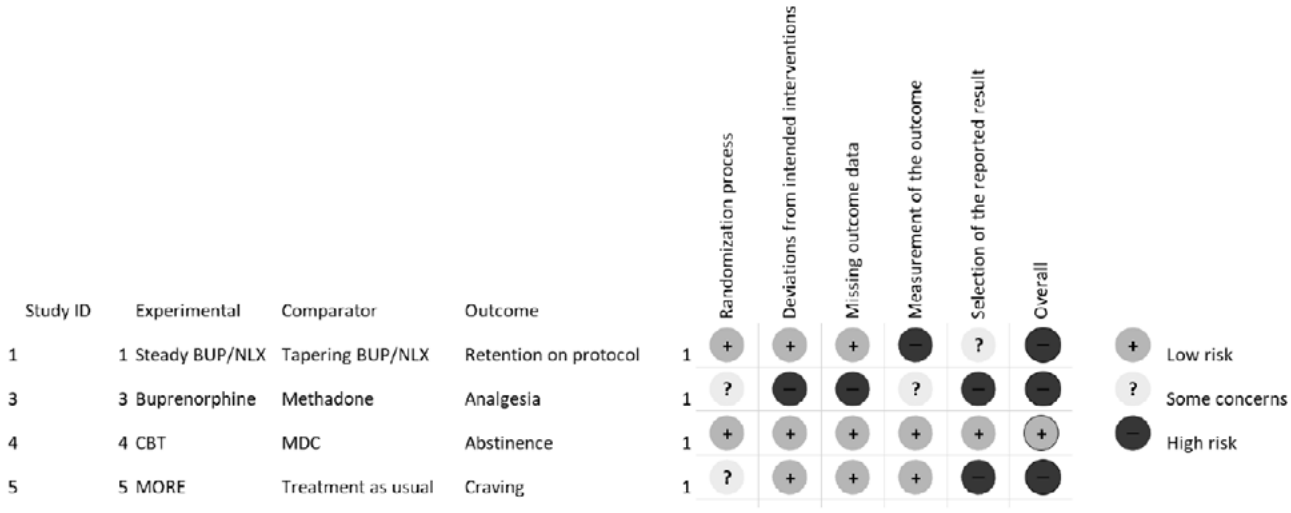


Figure 3. **Rob2 risk of bias panel for included randomized clinical trials (intention-to-treat analysis).**

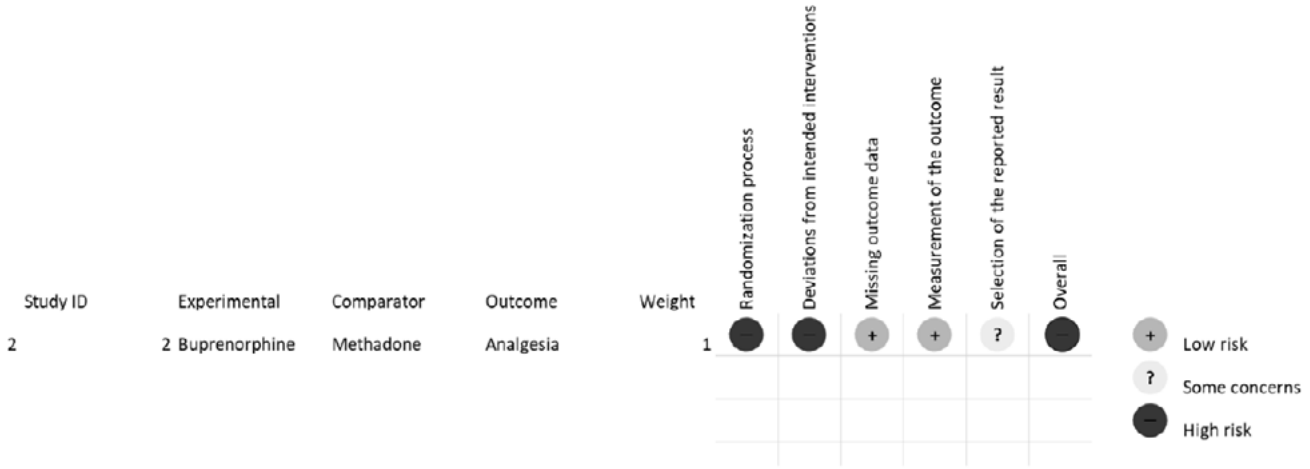


Figure 4. **Rob2 risk of bias panel for included randomized clinical trials (per-protocol analysis).**

there was a reduction of pain from baseline of 12.75% (Cohen's d 0.52) (Neumann et al., 2013).

Further details of the included studies are summarized in Table 1 for the observational studies and in Table 2 for the RCTs.

Psychological treatments

CBT was studied in 1 RCT (a pilot study, which its main outcomes were acceptability and feasibility, not efficacy). It reported a significant higher proportion of abstinence in patients undergoing CBT (Wald χ^2 (1) = 5.47, p = .019). Number of maximum consecutive weeks of abstinence from nonmedical opioid use was higher for patients assigned to CBT than for patients assigned to control group (mean 6.1 [SD 4.2] and 3.9 [SD 3.3]), respectively, Cohen's d 0.58, calculated for this systematic review). On the other hand, no significant differences were found in terms of analgesia (Barry et al., 2019).

Mindfulness was studied in 1 ecological momentary assessment of an RCT (not yet completed). It reported a significant reduction of craving and stress and a significant increase of the positive affect (Group X Time B = -0.019, SE = 0.005, p < .001). Nevertheless, no significant differences were found related to analgesia (Garland, Hanley, Kline & Cooperman, 2019).

Further details of these studies are summarized in Table 3.

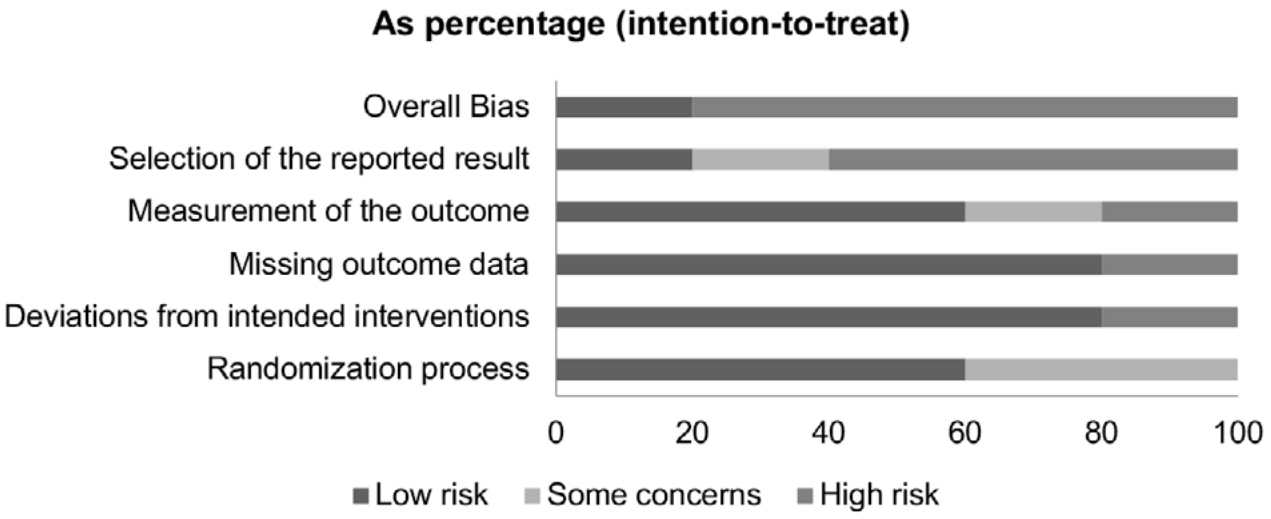


Figure 5. **Rob2 risk of bias panel for included randomized clinical trials (intention-to-treat analysis).**

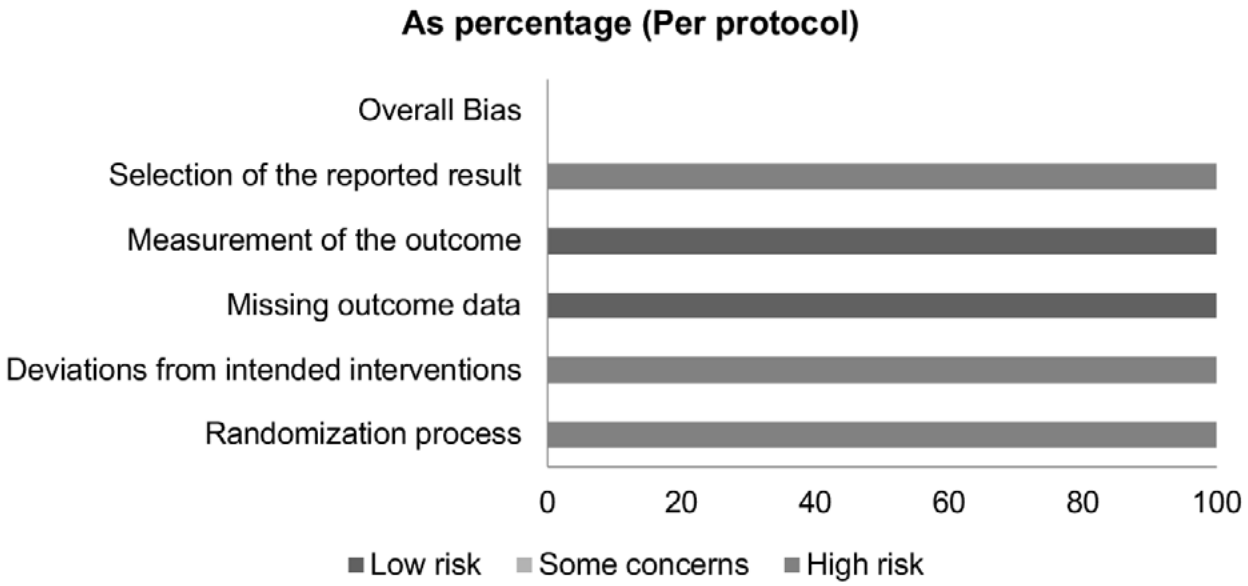


Figure 6. **Rob2 risk of bias panel for included randomized clinical trials (per-protocol analysis).**

Methodological quality assessment

Using the Rob 2 Cochrane tool (Sterne et al., 2019), 5 clinical trials were analyzed for their risk of bias (Figures 3-6).

3 pharmacological RCTs were assessed: 1 comparing steady doses of buprenorphine with tapering doses and 2 comparing buprenorphine's efficacy with methadone's. Buprenorphine was proven to be better when administered in steady doses but could not demonstrate superiority compared to methadone. However, all three studies showed an overall high risk of bias, mainly, due to substantial deviations from the protocol.

2 psychological RCTs were assessed: 1 study compared CBT and methadone counseling and 1 study compared mindfulness and methadone maintenance treatment. Both therapies reported significant higher abstinence rates and/or emotional improvement (craving, anxiety, stress) but did not demonstrate substantial differences in terms of analgesia. When assessed, only the CBT study had an overall low risk of bias, whereas the mindfulness study came up with a high risk of bias, showing a notable bias in the selection of the reported result. Despite the low risk of bias of the CBT trial, it should be borne in mind that it is a pilot study.

Discussion

After full-extraction and analysis of the studies, none of the proposed therapies (methadone, buprenorphine-naloxone, CBT and mindfulness) have demonstrated strong evidence for treating comorbid OUD and CNPC, in at least 2 RCT with low risk of bias including a control group (placebo, active comparator or treatment as usual).

Methadone and buprenorphine are useful in treating comorbid OUD and CNCP. However, this evidence is based on observational studies and three low quality RCTs. Methadone could not be assessed in the RCTs, as it was used as active comparator. On buprenorphine, maintenance strategy seems more useful than a decreasing-doses strategy towards discontinuation (Blondell et al., 2010), as pain aroused and increased the demand of painkillers. Buprenorphine could not demonstrate being more effective than methadone in two superiority RTCs (Neumann et al., 2013, 2019) neither for pain nor abstinence. However, when the groups were analyzed across both treatments, a significant improvement was found compared to baseline. With this insufficient evidence and the limitations of studies, no statement about efficacy or evaluation can be made about which treatment is preferred. It is clear that opioid substitution therapy is necessary for these patients but the assessment of efficacy should be studied in a double blind randomized basis with larger population; with a randomization that took into account the baseline pain intensity and prior use of opioids; primary outcomes defined as the change from baseline in opioid use (if relapse is the primary outcome) measured only by one method or change from baseline in pain intensity (if analgesia is the primary outcome) using standardized tools for measuring chronic pain (e.g., Brief Pain Inventory [Cleeland, 2009]).

Regarding its pharmacodynamics, buprenorphine-naloxone would be a better option for its safety profile but for uncontrolled/severe pain with buprenorphine-naloxone, methadone should be considered in highly motivated patients (Neumann et al., 2019).

Regarding psychological interventions, two different interventions were studied with RCT design: CBT and mindfulness. Both studies claim to be the first of their type in these patients. In fact, one is a pilot study and the other is an ecological momentary assessment of an unfinished clinical trial. Results are positive towards managing negative emotions related to OUD and CNCP. However, none demonstrate greater improvement of pain than standard treatment (Barry et al., 2019; Garland et al., 2019). In addition, as pilot studies, the primary outcomes are feasibility and acceptance rather than actual OUD and CNCP outcomes, which reduces their reliability and precludes assessing the real efficacy. Moreover, only one study assessing the efficacy of CBT was considered to have a low risk of bias. Future studies should contemplate the same recommendations stated for the pharmacological studies except for the double-blind basis, in which it is not applicable. Additionally, the main outcomes should be related with efficacy, as feasibility and acceptance have already been demonstrated.

Only one literature review (Eilender, Ketchen, Maremmani, Saenger & Fareed, 2016) and one systematic review (Morasco et al., 2011) have been found on this topic. The systematic review tried to assess the efficacy of treatment for OUD and CNCP (among other questions regarding OUD and CNCP like epidemiological features or risk factors involved), reporting an average-low quality of evidence. However, when articles within the revision where analyzed, most of them did not accomplish having all the patients previously diagnosed with OUD and CNCP. Our current revision includes 8 articles that did not appear in the 2011 referred systematic review. This might be the first systematic review to include only studies in which their participants are already diagnosed with OUD and CNCP with a therapeutic intervention performed to treat both conditions.

We found a lack of terminology consensus. Terms like "addiction", "misuse", "abuse" or "dependence" are often used as synonyms. In part because criteria over opioid use disorder has changed from DSM-IV to DSM-V, text used as reference in psychiatry. DSM-IV used the terms "dependence" and "abuse" distinctly whereas DSM-V includes both under "opioid-related disorders". A series of questionnaires designed to identify opioid use disorders during long opioid treatment may be helpful to complement the diagnosis like the Current Opioid Misuse Measure, the Prescription Drug Use Questionnaire, the Pain Medication Questionnaire or the Prescription Opioid Misuse Index (Knisely, Wunsch, Cropsey & Campbell, 2008). The heterogeneity of these diagnostic tools does not facilitate obtaining strong conclusions. Moreover, other variables like quality of life or pain evolution should be considered.

Research seems to go towards preventing and diagnosing OUD in CNCP patients instead of treating them once OUD occurs. Tapering appears to be a valid option when OUD has not yet set up (Sullivan et al., 2017). Abuse deterrent formulations are an interesting preventive measure. They are designed so misusing opioids (snorting, injecting, crushing) would have no effect (Volkow & Thomas McLellan, 2016). Also, naltrexone, an opioid antagonist approved for treating opioid and/or alcohol use disorder, has recently demonstrated anti-inflammatory effects at low doses that would be useful in this population (Heinzerling, 2019). Nevertheless, none of these options have been approved for comorbid OUD and CNCP. Moreover, physicians, worried about this problem, are starting to get trained to be able to detect and evaluate patients with CNCP and problematic use of opioids (Butner et al., 2018).

This review has some limitations. Firstly, the strict criteria regarding the population (patients with both OUD

and CNCP) has caused a selection of very heterogenous studies with different proposed therapies and designs, making difficult to offer a strong assessment on the efficacy of every treatment. In addition, investigators are aware that only 9 studies included in the review do not offer strong conclusions on treating these patients because only articles that reported that all the participants had both OUD and CNPC and had an intervention applied for treating both conditions were admitted. For this reason, articles that studied CNCP and comorbid substance use disorder (but not specifically OUD), articles that focused on addiction to prescription opioids (but without a CNCP diagnose established) and articles including population on opioid treatment and at risk of misuse but without an actual OUD diagnosis, have been excluded. Secondly, due to this heterogeneity of the studies, it has not been possible to conduct a quantitative analysis. Thirdly, since the search process and selection were carried out from January 2020 to March 2020 and the articles were eligible until December 2019, no articles of 2020 and 2021 were included. For this same reason, latest PRISMA guidelines were not used, as they were yet not published during the making of this review. Fourthly, although the research and writing process was done by six investigators, only one investigator performed the initial selection of the articles. Despite being supervised the entire time, no inter-judge reliability or kappa factor could be assessed for this reason. However, in case of doubt, two investigators were consulted during the selection process. Fifthly, no truncation nor codification book were used to perform the search. Although it could have been useful, the PRISMA guideline that we followed did not require it.

Due to the lack of strong evidence, it is unclear whether the opioid agonist treatment should be maintained or tapered and which drug should be prescribed for the opioid substitution therapy (methadone or buprenorphine/naloxone). However, buprenorphine might be preferred for its safer profile. Mindfulness and cognitive behavioral therapy have shown a discrete effect on improving negative affect but not pain. Further research about treatment in these patients is urgently needed due to the synergic impact of these entities on morbimortality and their prevalence.

Acknowledgements

López-Pelayo, H. works under CERCA Programme/Generalitat de Catalunya and receives funding from the Spanish Ministry of Science, Innovation and Universities, Instituto de Salud Carlos III through a "Juan Rodes" contract (JR19/00025).

Gual, A., Lligoña, A. and López-Lazcano A. work under CERCA Programme/Generalitat de Catalunya.

Study has been registered in PROSPERO database (CRD42020198672).

Conflict of interests

López-Pelayo, H. received training grants (Exeltis, Pfizer, Esteve, Lundbeck). Dr. Gual received a grant from Novartis for a trial on cocaine that ended in April 2020. None of the previous conflicts of interest has relationship with this work. Other authors do not report any conflict of interest.

References

American Psychiatric Association. (1993). *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.). American Psychiatric Association.

American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Disorders* (4th-TR ed.). American Psychiatric Association.

Barry, D. T., Beitel, M., Cutter, C. J., Fiellin, D. A., Kerns, R. D., Moore, B. A.,… Schottenfeld, R. S. (2019). An evaluation of the feasibility, acceptability, and preliminary efficacy of cognitive-behavioral therapy for opioid use disorder and chronic pain. *Drug and Alcohol Dependence*, *194*, 460–467. doi:10.1016/j.drugalcdep.2018.10.015.

Beck, A., Ward, C., Mendelson, M., Mock, J. & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, *4*, 561–571. doi:10.1001/archpsyc.1961.01710120031004.

Blondell, R. D., Ashrafioun, L., Dambra, C. M., Foschio, E. M., Zielinski, A. L. & Salcedo, D. M. (2010). A clinical trial comparing tapering doses of buprenorphine with steady doses for chronic pain and co-existent opioid addiction. *Journal of Addiction Medicine*, *4*, 140–146. doi:10.1097/ADM.0b013e3181ba895d.

Bowen, S., Chawla, N. & Marlatt, G. A. (2011). *Mindfulness-based relapse prevention for addictive behaviors: A clinician's guide.* Guilford Press.

Brown, R. E. & Sloan, P. A. (2017). The opioid crisis in the United States. *Anesthesia & Analgesia*, *125*, 1432–1434. doi:10.1213/ANE.0000000000002417.

Busse, J. W., Craigie, S., Juurlink, D. N., Buckley, D. N., Li, W., Couban, R. J.,… Guyatt, G. H. (2017). Guideline for opioid therapy and chronic noncancer pain. *Cmaj*, *189*, 659–666. doi:10.1503/cmaj.170363.

Butner, J. L., Bone, C., Ponce Martinez, C. C., Kwon, G., Beitel, M., Madden, L. M.,… Barry, D. T. (2018). Training addiction counselors to deliver a brief psychoeducational intervention for chronic pain among patients in opioid agonist treatment: A pilot investigation. *Substance Abuse*, *39*, 199–205. doi:10.1080/08897077.2018.1449052.

Chen, J. Y., Yu, J. C., Cao, J. P., Xiao, Y., Gu, H., Zhong, R. l.,… Wang, Z. Z. (2019). Abstinence following a motivation-skill-desensitization-mental energy intervention for heroin dependence: A three-year follow-up result of a randomized controlled trial. *Current Medical Science*, *39*, 472–482. doi:10.1007/s11596-019-2062-y.

Chou, R., Turner, J. A., Devine, E. B., Hansen, R. N., Sullivan, S. D., Blazina, I.,… Deyo, R. A. (2015). The effectiveness and risks of long-term opioid therapy for chronic pain: A systematic review for a national institutes of health pathways to prevention workshop. *Annals of Internal Medicine*, *162*, 276–286. doi:10.7326/M14-2559.

Cleeland, C. S. (2009). The *brief pain inventory user guide*. Retrieved at https://www.mdanderson.org/documents/Departments-and-Divisions/Symptom-Research/BPI_UserGuide.pdf.

Dowell, D., Haegerich, T. & Chou, R. (2016). CDC guideline for prescribing opioids for chronic pain—United States. *JAMA*, *315*, 1624–1645.

Dutra, L., Stathopoulou, G., Basden, S. L., Leyro, T. M., Powers, M. B. & Otto, M. W. (2008). A meta-analytic review of psychosocial interventions for substance use disorders. *American Journal of Psychiatry*, *165*, 179–187. doi:10.1176/appi.ajp.2007.06111851.

Eccleston, C., Fisher, E., Thomas, K. H., Hearn, L., Derry, S., Stannard, C.,… Moore, R. A. (2017). Interventions for the reduction of prescribed opioid use in chronic non-cancer pain. *Cochrane Database of Systematic Reviews*, *41*, 329–330. doi:10.1002/14651858.CD010323.pub3.

Eilender, P., Ketchen, B., Maremmani, I., Saenger, M. & Fareed, A. (2016). Treatment approaches for patients with opioid use disorder and chronic noncancer pain: A literature review. *Addictive Disorders & Their Treatment*, *15*, 85–98. doi:10.1097/ADT.0000000000000078.

Els, C., Straube, S., Jackson, T., Kunyk, D., Lappi, V., Sonnenberg, B.,… Kolahdooz, F. (2017). Adverse events associated with medium-and long-term use of opioids for chronic non-cancer pain: An overview of cochrane reviews (review). Adverse events associated with medium-and long-term use of opioids for chronic. *Cochrane Database of Systematic Reviews*, *10*. doi:10.1002/14651858.CD012509.pub2.

Garland, E. L., Hanley, A. W., Kline, A. & Cooperman, N. A. (2019). Mindfulness-oriented recovery enhancement reduces opioid craving among individuals with opioid use disorder and chronic pain in medication assisted treatment: Ecological momentary assessments from a stage 1 randomized controlled trial. *Drug and Alcohol Dependence*, *203*, 61–65. doi:10.1016/j.drugalcdep.2019.07.007.

Garland, E. L. & Howard, M. O. (2013). Mindfulness-oriented recovery enhancement reduces pain attentional bias in chronic pain patients. *Psychotherapy and Psychosomatics*, *82*, 311–318. doi:10.1159/000348868.

Garland, E. L. & Howard, M. O. (2018). Mindfulness-based treatment of addiction: Current state of the field and envisioning the next wave of research. In *Addiction Science and Clinical Practice* (Vol. 13, Issue 1). BioMed Central Ltd. doi:10.1186/s13722-018-0115-3.

Garland, E. L., Manusov, E. G., Froeliger, B., Kelly, A., Williams, J. M. & Howard, M. O. (2014). Mindfulness-oriented recovery enhancement for chronic pain and prescription opioid misuse: Results from an early-stage randomized controlled trial. *Journal of Consulting and Clinical Psychology*, *82*, 448–459. doi:10.1037/a0035798.

Gracely, R. H. & Kwilosz, D. M. (1988). The Descriptor Differential Scale: Applying psychophysical principles to clinical pain assessment. *Pain*, *35*, 279–288. doi:10.1016/0304-3959(88)90138-8.

Heinzerling, K. G. (2019). Applying best practice guidelines on chronic pain in clinical practice. Treating patients who suffer from pain and addiction. In I. Danovitch & L. J. Mooney (Eds.), *The assessment and treatment of addiction: Best practices and new frontiers* (pp. 137–156). Missouri: Elsevier.

Ilgen, M. A., Bohnert, A. S. B., Chermack, S., Conran, C., Jannausch, M., Trafton, J. & Blow, F. C. (2016). A randomized trial of a pain management intervention for adults receiving substance use disorder treatment. *Addiction*, *111*, 1385–1393. doi:10.1111/add.13349.

International Association for the Study of Pain. (2020). *IASP Announces Revised Definition of Pain*. Pain. Retrieved at https://www.iasp-pain.org/PublicationsNews/NewsDetail.aspx?ItemNumber=10475.

Kampman, K. & Jarvis, M. (2015). American Society of Addiction Medicine (ASAM) national practice guideline for the use of medications in the treatment of addiction involving opioid use. *Journal of Addiction Medicine*, *9*, 358–367. doi:10.1097/ADM.0000000000000166.

Knisely, J. S., Wunsch, M. J., Cropsey, K. L. & Campbell, E. D. (2008). Prescription opioid misuse index: A brief questionnaire to assess misuse. *Journal of Substance Abuse Treatment*, *35*, 380–386. doi:10.1016/j.jsat.2008.02.001.

Li, W., Howard, M. O., Garland, E. L., McGovern, P. & Lazar, M. (2017). Mindfulness treatment for substance misuse: A systematic review and meta-analysis. *Journal of Substance Abuse Treatment*, *75*, 62–96. doi:10.1016/j.jsat.2017.01.008.

Mattick, R. P., Breen, C., Kimber, J. & Davoli, M. (2014). Buprenorphine maintenance versus placebo or methadone maintenance for opioid dependence. *Cochrane Database of Systematic Reviews*, *CD002207*. doi:10.1002/14651858.CD002207.pub4.

Moher, D., Liberati, A., Tetzlaff, J. & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *BMJ*, *339*, 2535–2535. doi:10.1136/bmj.b2535.

Morasco, B. J., Gritzner, S., Lewis, L., Oldham, R., Turk, D. C. & Dobscha, S. K. (2011). Systematic review of prevalence, correlates, and treatment outcomes for chronic non-cancer pain in patients with comorbid substance use disorder. *Pain*, *152*, 488–497. doi:10.1016/j.pain.2010.10.009.

Murdoch University. (2021). *Systematic Reviews - Research Guide*. Library. Retrieved at https://libguides.murdoch.edu.au/systematic/databases.

Nahin, R. L. (2015). Estimates of pain prevalence and severity in adults: United States, 2012. *The Journal of Pain*, *16*, 769–780. doi:10.1016/j.jpain.2015.05.002.

National Institutes of Health. (2014). *Pathways to prevention workshop: The role of opioids in the treatment of chronic pain* (Vol. 1). doi: 10.1017/CBO9781107415324.004.

National Library of Medicine US. (2019). *Buprenorphine and methadone for opioid-dependent chronic back pain patients*. Retrieved at https://clinicaltrials.gov/ct2/show/NCT01559454?cond=buprenorphine+methadone+low+back+pain&draw=2&rank=1.

Neumann, A. M., Blondell, R. D., Hoopsick, R. A. & Homish, G. G. (2019). Randomized clinical trial comparing buprenorphine/naloxone and methadone for the treatment of patients with failed back surgery syndrome and opioid addiction. *Journal of Addictive Diseases*, *0*, 1–9. doi:10.1080/10550887.2019.1690929.

Neumann, A. M., Blondell, R. D., Jaanimägi, U., Giambrone, A. K., Homish, G. G., Lozano, J. R.,… Azadfard, M. (2013). A preliminary study comparing methadone and buprenorphine in patients with chronic pain and co-existent opioid addiction. *Journal of Addictive Diseases*, *32*, 68–78. doi:10.1080/10550887.2012.759872.

Noble, M., Treadwell, J. R., Tregear, S. J., Coates, V. H., Wiffen, P. J., Akafomo, C. & Schoelles, K. M. (2010). Long-term opioid management for chronic noncancer pain. *Cochrane Database of Systematic Reviews*, *3*. doi:10.1002/14651858.CD006605.

Pade, P. A., Cardon, K. E., Hoffman, R. M. & Geppert, C. M. A. (2012). Prescription opioid abuse, chronic pain, and primary care: A co-occurring disorders clinic in the chronic disease model. *Journal of Substance Abuse Treatment*, *43*, 446–450. doi:10.1016/j.jsat.2012.08.010.

Rhodin, A., Grönbladh, L., Nilsson, L.-H. & Gordh, T. (2006). Methadone treatment of chronic non-malignant pain and opioid dependence- a long-term follow-up. *European Journal of Pain*, *10*, 271–278. doi:10.1016/j.ejpain.2005.05.003.

Rudd, R. A., Seth, P., David, F. & Scholl, L. (2016). Increases in drug and opioid-involved overdose deaths — United States, 2010–2015. *MMWR. Morbidity and Mortality Weekly Report*, *65*, 1445–1452. doi:10.15585/mmwr.mm655051e1.

Skinner, H. A. (1982). The Drug Abuse Screening Test (DAST). *Addictive Behaviors*, *7*, 1.

Sterne, J. A. C., Savović, J., Page, M. J., Elbers, R. G., Blencowe, N. S., Boutron, I.,… Higgins, J. P. T. (2019). RoB 2: A revised tool for assessing risk of bias in randomised trials. *BMJ*, *366*. doi:10.1136/bmj.l4898.

Streltzer, J., Davidson, R. & Goebert, D. (2015). An observational study of buprenorphine treatment of the prescription opioid dependent pain patient. *The American Journal on Addictions*, *24*, 357–361. doi:10.1111/ajad.12198.

Sullivan, M. D., Turner, J. A., DiLodovico, C., D'Appollonio, A., Stephens, K. & Chan, Y.-F. (2017). Prescription opioid taper support for outpatients with chronic pain: A randomized controlled trial. *The Journal of Pain*, *18*, 308–318. doi:10.1016/j.jpain.2016.11.003.

Vidrine, J. I., Spears, C. A., Heppner, W. L., Reitzel, L. R., Marcus, M. T., Cinciripini, P. M.,… Wetter, D. W. (2016). Efficacy of mindfulness-based addiction treatment (MBAT) for smoking cessation and lapse recovery: A randomized clinical trial. *Journal of Consulting and Clinical Psychology*, *84*, 824–838. doi: 10.1037/ccp0000117.

Volkow, N. D. & Thomas McLellan, A. (2016). Opioid abuse in chronic pain-misconceptions and mitigation strategies. *New England Journal of Medicine*, *374*, 1253–1263. doi:10.1056/NEJMra1507771.

Vowles, K. E., McEntee, M. L., Julnes, P. S., Frohe, T., Ney, J. P. & Van Der Goes, D. N. (2015). Rates of opioid misuse, abuse, and addiction in chronic pain: A systematic review and data synthesis. *Pain*, *156*, 569–576. doi:10.1097/01.j.pain.0000460357.01998.f1.

Waddell, G., McCulloch, J. & Kummel, E. (1980). Nonorganic physical signs in low back pain. *Spine*, *5*, 117–125.

Weiss, R. D., Sharpe Potter, J., Fiellin, D. A., Byrne, M., Connery, H. S., Dickinson, W.,… Ling, W. (2011). Adjunctive counseling during brief and extended buprenorphine-naloxone treatment for prescription opioid dependence: A 2-phase randomized controlled trial. *Arch Gen Psychiatry*, *68*, 1238–1246.

Wiffen, P. J., Wee, B., Derry, S., Bell, R. F. & Moore, R. A. (2017). Opioids for cancer pain - an overview of cochrane reviews. *Cochrane Database of Systematic Reviews*, *2017*. doi:10.1002/14651858.CD012592.pub2.

Williams, A. C. de C., Eccleston, C. & Morley, S. (2012). Psychological therapies for the management of chronic pain (excluding headache) in adults. *Cochrane Database of Systematic Reviews*, *11*. doi:10.1002/14651858.CD007407.pub3.

World Health Organization. (2019). *Chronic pain*. International Classification of Diseases - 11th Edition. Retrieved at https://icd.who.int/browse11/l-m/en#/http://id.who.int/icd/entity/1581976053.

Worley, M. J., Heinzerling, K. G., Shoptaw, S. & Ling, W. (2017). Volatility and change in chronic pain severity predict outcomes of treatment for prescription opioid addiction. *Addiction*, *112*, 1202–1209. doi:10.1111/add.13782.

Annex 1: Excluded articles after full-text revision

Garland, E. L. (2014). Disrupting the downward spiral of chronic pain and opioid addiction with mindfulness-oriented recovery enhancement: A review of clinical outcomes and neurocognitive targets. *Journal of Pain and Palliative Care Pharmacotherapy*, *28*, 122–129. doi:10.3109/15360288.2014.911791.

Weiss, R. D., Griffin, M. L., Potter, J. S., Dodd, D. R., Dreifuss, J. A., Connery, H. S. & Carroll, K. M. (2014). Who benefits from additional drug counseling among prescription opioid-dependent patients receiving buprenorphine–naloxone and standard medical management? *Drug and Alcohol Dependence*, *140*, 118–122. doi:10.1016/j.drugalcdep.2014.04.005.

Berland, D. W., Malinoff, H. L., Weiner, M. A. & Przybylski, R. (2013). When opioids fail in chronic pain management: the role for buprenorphine and hospitalization. *American Journal of Therapeutics*, *20*, 316–321. doi:10.1097/MJT.0b013e31827ab599.

Suzuki, J., Matthews, M. L., Brick, D., Nguyen, M. T., Jamison, R. N., Ellner, A. L. & Weiss, R. D. (2014). Implementation of a collaborative care management program with buprenorphine in primary care: A comparison between opioid-dependent patients and patients with chronic pain using opioids nonmedically. *Journal of Opioid Management*, *10*, 159–168. doi:10.5055/jom.2014.0204.

Currie, S. R., Hodgins, D. C., Crabtree, A., Jacobi, J. & Armstrong, S. (2003). Outcome from integrated pain management treatment for recovering substance abusers. *Journal of Pain*, *4*, 91–100. doi:10.1054/jpai.2003.17.

Garland, E. L., Bryan, C. J., Finan, P. H., Thomas, E. A., Priddy, S. E., Riquino, M. R. & Howard, M. O. (2017). Pain, hedonic regulation, and opioid misuse: modulation of momentary experience by mindfulness-oriented recovery enhancement in opioid-treated chronic pain patients. *Drug and Alcohol Dependence*, *173 (Suppl. 1)*, 65–72. doi:10.1016/j.drugalcdep.2016.07.033.

Garland, E. L., Howard, M. O., Zubieta, J.-K. & Froeliger, B. (2017). Restructuring hedonic dysregulation in chronic pain and prescription opioid misuse: Effects of mindfulness-oriented recovery enhancement on responsiveness to drug cues and natural rewards. *Psychotherapy and Psychosomatics*, *86*, 111–112. doi:10.1159/000453400.

Priddy, S. E., Hanley, A. W., Riquino, M. R., Platt, K. A., Baker, A. K. & Garland, E. L. (2018). Dispositional mindfulness and prescription opioid misuse among chronic pain patients: Craving and attention to positive information as mediating mechanisms. *Drug and Alcohol Dependence*, *188*, 86–93. doi:10.1016/j.drugalcdep.2018.03.040.

Guarino, H., Fong, C., Marsch, L. A., Acosta, M. C., Syckes, C., Moore, S. K. & Rosenblum, A. (2018). Web-based cognitive behavior therapy for chronic pain patients with aberrant drug-related behavior: Outcomes from a randomized controlled trial. *Pain Medicine (Malden, Mass.)*, *19*, 2423–2437. doi:10.1093/pm/pnx334.

Garland, E. L., Froeliger, B. & Howard, M. O. (2014). Effects of mindfulness-oriented recovery enhancement on reward responsiveness and opioid cue-reactivity. *Psychopharmacology*, *231*, 3229–3238. doi:10.1007/s00213-014-3504-7.

Roux, P., Sullivan, M. A., Cohen, J., Fugon, L., Jones, J. D., Vosburg, S. K. & Comer, S. D. (2013). Buprenorphine/naloxone as a promising therapeutic option for opioid abusing patients with chronic pain: Reduction of pain, opioid withdrawal symptoms, and abuse liability of oral oxycodone. *Pain*, *154*, 1442–1448. doi:10.1016/j.pain.2013.05.004.

Taveros, M. C. & Chuang, E. J. (2017). Pain management strategies for patients on methadone maintenance therapy: A systematic review of the literature. *BMJ Supportive & Palliative Care*, *7*, 383–389. doi:10.1136/bmjspcare-2016-001126.

Dennis, B. B., Bawor, M., Paul, J., Plater, C., Pare, G., Worster, A.,… Samaan, Z. (2016). Pain and opioid addiction: A systematic review and evaluation of pain measurement in patients with opioid dependence on methadone maintenance treatment. *Current Drug Abuse Reviews*, *9*, 49–60.

Garland, E. L. & Howard, M. O. (2013). Mindfulness-oriented recovery enhancement reduces pain attentional bias in chronic pain patients. *Psychotherapy and Psychosomatics*, *82*, 311–318. doi:10.1159/000348868.

Latif, Z.-H., Solli, K. K., Opheim, A., Kunoe, N., Benth, J. Š., Krajci, P. & Tanum, L. (2019). No increased pain among opioid-dependent individuals treated with extended-release naltrexone or buprenorphine-naloxone: A 3-month randomized study and 9-month open-treatment follow-up study. *The American Journal on Addictions*, *28*, 77–85. doi:10.1111/ajad.12859.

Weiss, R. D., Potter, J. S., Fiellin, D. A., Byrne, M., Connery, H. S., Dickinson, W.,… Ling, W.(2011). Adjunctive counseling during brief and extended

buprenorphine-naloxone treatment for prescription opioid dependence: A 2-phase randomized controlled trial. *Archives of General Psychiatry*, *68*, 1238–1246. doi:10.1001/archgenpsychiatry.2011.121.

Weiss, R. D., Potter, J. S., Griffin, M. L., Provost, S. E., Fitzmaurice, G. M., McDermott, K. A.,… Carroll, K. M. (2015). Long-term outcomes from the national drug abuse treatment clinical trials network prescription opioid addiction treatment study. *Drug and Alcohol Dependence*, *150*, 112–119. doi:10.1016/j.drugalcdep.2015.02.030.

Potter, J. S., Dreifuss, J. A., Marino, E. N., Provost, S. E., Dodd, D. R., Rice, L. S.,… Weiss, R. D. (2015). The multi-site prescription opioid addiction treatment study: 18-month outcomes. *Journal of Substance Abuse Treatment*, *48*, 62–69. doi:10.1016/j.jsat.2014.07.009.

Garland, E. L., Manusov, E. G., Froeliger, B., Kelly, A., Williams, J. M. & Howard, M. O. (2014). Mindfulness-oriented recovery enhancement for chronic pain and prescription opioid misuse: Results from an early-stage randomized controlled trial. *Journal of Consulting and Clinical Psychology*, *82*, 448–459. doi:10.1037/a0035798.

Jamison, R. N., Ross, E. L., Michna, E., Chen, L. Q., Holcomb, C. & Wasan, A. D. (2010). Substance misuse treatment for high-risk chronic pain patients on opioid therapy: A randomized trial. *Pain*, *150*, 390–400. doi:10.1016/j.pain.2010.02.033.

Garland, E. L., Hanley, A. W., Riquino, M. R., Reese, S. E., Baker, A. K., Salas, K.,… Howard, M. O. (2019). Mindfulness-oriented recovery enhancement reduces opioid misuse risk via analgesic and positive psychological mechanisms: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*, *87*, 927–940. doi:10.1037/ccp0000390.

AUTHOR GUIDELINES

Adicciones is published by **Socidrogalcohol** (*Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y otras Toxicomanías*; Spanish Society for Studies on Alcohol, Alcoholism and other Drug Addictions).

Adicciones publishes original articles on treatment, prevention, policy, basic studies and descriptive studies in the field of addictions, including those to illegal drugs, alcohol and tobacco and any other addiction, and originating from various disciplines (medicine, psychology, basic research, social research, etc.). All articles are selected after undergoing an anonymous review process by experts on each topic.

Adicciones publishes four issues per year in March, June, September and December. The journal has the following sections: Editorial, original articles, brief reports, review articles and letters to the Editor.

1. GENERAL DESCRIPTION

Languages

The journal accepts articles in Spanish and in English. The final edition of the articles will be published in both languages.

Conflicts of interest

The journal's policy is that all articles and editorials expressly state whether or not there are conflicts of interest in the corresponding section. All conflicts of interest are important, but particular care should be taken in cases of having received funding for the study from the pharmaceuticals, drinks or tobacco industries, or comparable sources. In this regard *Adicciones* follows the recommendations of the ISAJE (*International Society of Addiction Journals Editors*). The existence of a conflict of interests does not mean the article cannot be published. In cases of doubt over this issue, please contact the Editorial Board.

Authorship

The articles must be original. It is very important to consider as authors only those who have made substantial contributions: 1) to the conception and design, data collection, or analysis and interpretation of data; 2) to the writing of the article or its critical review; and who have given their approval to the version submitted for publication. The authors should ensure that significant portions of the material have not been published previously. In case of doubt about the fulfilment of this requirement, copies should be provided of the material in question previously published or submitted elsewhere before the article can be considered for review.

Any further doubts about these aspects can be clarified by consulting the Farmington Consensus, to which Adicciones subscribes: **https://www.isaje.net/farmington-consensus.html** or the publication rules of the American Psychological Association, 7th edition (2020).

2. PREPARATION OF MANUSCRIPTS

Authors should exclusively follow the Publication Guidelines of the American Psychological Association, 7th edition (2020) (**www.apastyle.org**).

Adicciones respects and encourages diversity. Authors should use inclusive language that is free of bias and stereotypes. There is NO precise limit on the number of words for articles submitted. However, great care should be taken to include only the information that is strictly necessary. It is important for articles to be of interest to the scientific community in the field of addictions. Authors should refrain from submitting articles referring to highly specific aspects – unless that is precisely their interesting feature – or that are basically descriptive – unless they deal with a novel issue.

Types of articles

Original Articles

These will preferably be works on clinical or experimental research in the field of drug dependence or addictions. Empirical manuscripts with large samples and solid methodologies will be especially valued.

Brief Reports

This section refers to research work which due to its special characteristics (small numbers of observations, clinical cases, research with highly specific aims and results, descriptive epidemiological studies, first results of a wide-ranging study, etc.) can be published in brief form. Where possible, these articles will have the same types of sections as full articles; they should be a maximum of 12 pages (double-spaced) in length.

Review Articles

Review articles should serve to update an issue in rigorous and exhaustive fashion. hese reviews should be governed by systematized methods (e.g., PRISMA criteria) and be registered in review protocol databases (e.g., PROSPERO).

Letters to the Editor

These will normally have a maximum of 800 words, 10 references and a table or figure. They may consist in a brief presentation on a new issue, an original research study, or a reply or comment in relation to an article published in the journal. In this last case the letter should arrive normally within the 6 weeks following publication of the article in the journal.

3. SUBMISSION PROCESS

All articles should be submitted through www.adicciones.es. In the platform it could be find all the instructions for manuscripts preparation and for submission. All the follow-up of the review and editorial process will be done through the web platform of Revista Adicciones. This is the only way to send articles (if you have any doubts or technical problems, please contact **revistaadicciones@socidrogalcohol.org**).

Structure of the works submitted to the Journal

The following documents must be prepared and attached for the submission of manuscripts:

A) Cover Letter. It should contain the purpose of the work, the rationale for why it was conducted and what contribution makes to already-existing knowledge, the potential audience for the study findings and the implications for the development of potential new works, and how the main findings of the study contribute to the development of new knowledge in the field of addictions.

B) Authorization document from all authors. All manuscripts submitted for consideration for publication in *Adicciones* will be accompanied by a letter signed by all authors. This document will state that:

1. The manuscript is original and has not been published previously, in whole or part, nor is it being considered for publication in another journal.
2. The funding that the study has received (direct or indirect) and whether it has connections with the tobacco, alcohol or pharmaceutical industry, or other relationships that could result in a conflict of interest.
3. That the manuscript has been written, read, and approved by the authors as submitted, and that authorship corresponds to all signatories.
4. That all ethical principles have been complied with in relation to the protection of persons or patients, or animals, when animal experimentation is involved.
5. That all the corresponding permissions to reproduce previously published material to be included in the manuscript, such as text, tables, figures, etc., are attached.
6. That correspondence concerning the manuscript submitted for publication will be handled by the corresponding author whose name, address, telephone number and e-mail address will be indicated. At the same time, this author will be responsible for contacting the other authors to request review and final approval of the article.
7. That the copyright of the article will be transferred to Adicciones in case it is published in the journal Adicciones.
8. The policy of the journal Adicciones is to disseminate its articles, thus authors can send their published articles to other people in electronic format. The reproduction and commercial dissemination of the journal's articles is restricted by copyright and requires permission from the journal.

C) Tittle Page. On the first page of the article the following information will appear, in the order as stated:

- Title of the article, in lower case (in Spanish and English), except initial letter.
- Authors' full forenames (not initials only), and one or two surnames (e.g.: Miguel García or Miguel García Rodríguez, or even Miguel García-Rodríguez, bearing in mind that the way in which the name appears is how it will be sent to the databases) in lower case, except for the first letter. The different authors' names will be separated by semicolons. After each author's surname, without an intervening space and in superscript, there should be an asterisk (1 for the first, 2 for the second, etc.). These asterisks are necessary for indicating the institution at which the work has been carried out (see following point).
- Preceded by one or more asterisks, as applicable (see previous point), the names of the institution(s) where the work has been carried out or where the authors work will be indicated.

At the bottom of the first page (not as a footnote), the following text will appear: "Send correspondence to: ...", indicating the name and postal address, e-mail or other contact information. This is the author with which the secretary will correspond during the review process, unless other arrangements are made by mutual agreement.

D) Manuscript. All pages should be numbered consecutively at top right. The order of presentation followed in the manuscript will be as follows:

1. The first page of the manuscript should indicate: Title of the article, in lower case (in Spanish and English), except initial letter.

2. The second page of the article will include an abstract in both Spanish and English, of between 120 and 250 words in length. Following the international publication rules set out above, the abstract should specify the objectives of the study or research, the basic methodology employed, the main results, and the most important and/or novel conclusions.

- The *abstract* should be written in one or more paragraphs according to the APA publication rules, *but not divided into antecedents, method, etc.*
- The abstract will be followed by a list of around 5 *Key words*, first in Spanish and then in English, in lower case and separated by commas. Where possible, these words should be in line with those normally used in well-known indices (e.g., Mesh terms).

3. The article proper will begin on the third page.
Review process will be anonymous, confidential and blinded, it is recommended that the authors delete any information that they consider could help to identify them, such as, for example, place of selection of participants, institution of membership of the Ethics Committee that has approved the study, etc. This information can be concealed by replacing it with the expression "[AUTHORS]" or similar. It is recommended for articles to be written in the passive voice, where appropriate. The text should be clearly divided into sections, following – as far as possible depending on the characteristics of the study – the general scheme: Introduction (though the word should not appear as a heading), Method, Results, Discussion, Acknowledgements, Conflict of interests and References.

Introduction

This section should be relatively brief, but provide the necessary and introductory explanation so that readers can understand the state of the issue prior to the research, and so that they can see the need for such research and how it was approached. This section should not include tables or figures, unless they are essential to the understanding of the text. It should include a final paragraph setting out clearly the objective(s) of the work.

Method

This section should clearly describe the methodology employed (selection of the sample, collection of data, data-collection or assessment instruments, timeframe, etc.). It should also identify the methods, assessment instruments, treatments, drugs used, apparatus, assessment system, statistical methods where they are new, new types of method, and so on. The author should specify the type of study (descriptive, epidemiological, experimental, clinical trial, etc.), system of assignment of participants to groups, randomization, etc. All submissions should indicate the reference of the Ethics Committee or Research Office which has approved the adequacy of this research to the corresponding ethical and legal framework. It is important that experimental studies and clinical trials are registered and the registration number is indicated in the trials database (e.g., Clinicaltrials.gov). Authors should state the type of statistical analysis used, describe it where it is new or little known, and indicate the statistics package employed. It is strongly recommended to indicate, when possible, the exact significance data obtained in the results (as opposed to formulas such as $p < .05$ or $p < .01$) as well as to include, also when possible, effect size statistics.

Results

The results should be presented in a logical sequence with regard to text, tables and figures. Use only those tables and figures that are strictly necessary, that clearly express the results of the study. Do not duplicate data in tables and figures. Do not repeat in the text all the data from the tables and figures, only the most important. Emphasize and summarize only the most important observations.

Adicciones adopts the conventional system of 5% as the value for statistical significance, and does not accept the consideration of trends with lower values.

Randomized clinical trials should follow the CONSORT guidelines (www.consort-statement.org) and studies with non-experimental designs should follow international guidelines (e.g.,STROBE https://www.strobe-statement.org/), to provide greater clarity for readers and reviewers. Likewise, effect size statistics will be presented.

Discussion

It is necessary to start with the general objective of the study. This section will emphasize the novel and important aspects of the study and the conclusions deriving from it. It should not repeat in detail the results presented in either the previous section or the introduction. The discussion should highlight the most important and controversial aspects and relate them to other relevant studies on the matter. Do not make assumptions if they are not supported by the data. Where appropriate, this section can include recommendations. Indicate the implications of the study's findings and its limitations (these will preferably be contained in a paragraph at the end of the article).

Acknowledgements

This section will be situated after the end of the article proper, and just before the Conflicts of interest. Where considered necessary, it will include the names of persons, institutions or bodies that have collaborated with or supported the research. It may include mention of those people who have helped in the preparation of the article, but not with the intensity required for being considered as authors. Sources of funding should also be indicated here.

Conflicts of interest.

All articles, editorials, comments, opinions, book reviews and letters published in the journal will be accompanied by a declaration about possible or actual conflicts of interest or a statement to the effect that the authors have no conflicts of interest to declare.

References

These will follow strictly the norms of the American Psychological Association [American Psychological Association (2020). *Publication Manual of the American Psychological Association* (7th ed.). Washington, DC. **http://www.apastyle.org**

Tables and Figures

These will appear at the end of the text, numbered, and each one on a different page. The place where they should be placed should be indicated in the text of the manuscript.

4. MANUSCRIPT REVIEW PROCESS

Articles are submitted to the journal via **www.adicciones.es**. On submitting the manuscript, authors receive a code for accessing the web and checking the situation of their article. However, the Editor will send them a message once a decision has been made or there is a need to query some matter. Once the manuscript has been received by the journal's offices, the review process will begin.

The Editor, normally in consultation with the Associate Editors, can reject an article immediately after its submission if it is not felt to be of sufficient quality or of priority interest for the journal.

All manuscripts, in order to be considered for publication in Adicciones, should adhere strictly to the publication rules of the journal (which are those of the APA). The Editor reserves the right to reject immediately (without progression to the review stage) those articles that fail to meet this requirement.

During the submission process, authors will be asked to provide the name of at least two possible reviewers for their article (name, institution, e-mail and ORCID. The proposed reviewers must be experts in the topic and not be linked to the research being developed in the submitted work. They should not belong to the current Editorial Board of Adicciones. The journal reserves the right to decide whether or not to use these proposed reviewers.

Manuscripts shall be sent by the Editor or Associate Editors to two or more experts in the field (reviewers), who will make the pertinent comments and recommend the changes they deem necessary; they may also give their opinion as to the acceptance or rejection of the article. The final decision, based on the report from the reviewers or from the Associate Editor in charge of the review process, will be taken by the Editor of the journal, who may also consult the Associate Editors. The review process will be "double blind". Throughout the review process the principle of confidentiality will be maintained by the reviewers towards the work they review, as well as the confidentiality of the names of the reviewers among themselves or to the authors of the manuscript. In this sense, the reviews will be anonymous, confidential and blind also for the reviewers, who will not know the names of the authors at any time.

The result of the manuscript review will be sent to the corresponding author, indicating its acceptance or rejection or the need for a new review once the author has taken into account all the comments by the reviewers and the Editor. Authors must make all the changes indicated as soon as possible (unless otherwise indicated the period will be two months, though this may be extended subject to justification by the authors) via the journal's electronic management system, sending:

- A copy of the final manuscript
- A copy of the revised manuscript.
- Another document setting out in detail the principal modifications made, together with authors' own comments on the main aspects of the review.

5. PUBLICATION PROCESS

Once the article has been accepted, the following procedure will be followed:

1. The authors will receive a version with possible format and style corrections, to which they must respond within a maximum of 10 days.
2. After receiving a reply from the authors, they will be informed of the estimated number of pages that will comprise the final version of the article, along with the article process charges.
3. Once payment has been received, the article will be translated into English or Spanish, depending on the original language of the article.
4. A final document or galley proof will be generated, which the authors must also review.
5. A DOI will be assigned to the work and it will be published in advance online, until pages are assigned within a specific volume in which the manuscripts will finally be published.

Authors are fully responsible for the final published version. The authors are free to distribute the article, as long as all pertinent information about the journal in which it was published is clearly stated.

Publication fees

The journal Adicciones is Open Access, which means that once published, the articles will be freely available on the web and other search platforms, allowing them to be sent and shared with the entire scientific community. This means that a number of expenses for editing, layout and distribution rights must be covered by the authors. The Open Access publication process complies with the requirements and recommendations established by the most recent calls for scientific funding such as Horizon 2020 and the Science Act of the Spanish Ministry of Science and Innovation, which promote open access to science.

The publication of new articles is subject to the payment of 50€ per printed page (VAT included) with a 30% discount if first author is a member of Socidrogalcohol. For those cases in which at least 50% of the authors belonging to developing countries (according to **World Bank**) will pay half the listed price. Exceptionally, when dealing with high quality articles, publication fees might be negotiated if facing serious economic problems.

6. COPYRIGHT

All copyright rights for articles published in Adicciones will be transferred to the journal. The authors agree to include in the manuscript all necessary permissions to reproduce previously published material, such as text, tables or figures.

2023 ■ VOL. 35 ■ N. 2
ADICCIONES

EDITORIAL

ORIGINALS / ORIGINALES

REVIEW / REVISIÓN

PUBLISHED BY:
SOCIDROGALCOHOL
Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y las otras Toxicomanías

FUNDED BY:
MINISTERIO DE SANIDAD
SECRETARÍA DE ESTADO DE SANIDAD
DELEGACIÓN DEL GOBIERNO PARA EL PLAN NACIONAL SOBRE DROGAS