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Addiction medicine: Beyond the DSM-5

Medicina de la adicción: Más allá del DSM5

HUGO LÓPEZ-PELAYO *,**; LAIA MIQUEL *,**; MERCEDES BALCELLS OLIVERÓ *,**.

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While one person in eleven worldwide has an alcohol use disorder, associated with more than 200 adverse health conditions, it is also estimated that 3.5% of the world's population has an illegal substance use disorder. Both disorders cause significant harm in multiple areas of health (social/family, economic/financial, mental, physical, etc.) and also represent a high burden of disease resulting in significant direct and indirect expenditure for the health system, thus adding a financial cost to the social cost of these disorders (Degenhardt et al., 2019; Glantz et al., 2020; Miquel et al., 2018). Against this background, the role of addiction medicine is important, yet it faces several challenges in the coming years, especially at a local level. An initial challenge is linked to the replacement of professionals in the addiction network. The mass retirement of professionals involved in setting up the addiction treatment network in our country in the middle of the last century is expected shortly. Nevertheless, there has been little generational replacement of professionals. A further

challenge to take into account is the increasing complexity of addictions, which is growing rapidly given the greater variety of toxic substances used (new psychoactive drugs) and the emergence of new patterns of use (e.g., chemsex, addiction to prescribed substances, etc.), and the presence of serious psychiatric or organic comorbidities. Similarly, the difficulty posed for the system by the ageing of the population served (for example, methadone maintenance treatments in the elderly or cognitive deterioration in patients with substance use disorders) should not be underestimated. At the same time, treatment for adolescents and young adults, especially for cannabis use or abusive use of video games is in greater demand. Finally, there is a legitimate demand from society that the management of mental health problems, and addictions in particular, be based on criteria of excellence and evidence-based medicine (from prevention to harm reduction).

The coming decade will be a period of change for the medical profession in general and in particular for professionals caring for patients with substance use disorder

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(SUD) or other addictive behaviours. In 2023, Spain had 301,648 registered doctors or, in other words, 6.2 doctors per 1,000 inhabitants. This represents an increase in absolute numbers of 3.2% compared to the previous year and 0.1% in the ratio of doctors per 1,000 inhabitants (a stable ratio over the last 10 years). This minimal increase in the number of registered doctors per 1,000 inhabitants is striking, considering that the population aged over 65 years, which makes the greatest use of the health system's resources, has not stopped growing. Due to retirements, among other factors, it is estimated that in 2025 there will be a slight shortfall of professionals in specialties which are strongly involved in the treatment of addictions, such as family and community medicine. Less than 10 years ago, these specialties had a slight surplus. These factors are prior to two phenomena that have further strained the national health system and the well-being and working conditions of health professionals in particular: the economic crisis that began in 2008 and the COVID-19 pandemic. This shortage of medical personnel will be further aggravated by retirements, with some 80,000 expected by 2034 (7,000 annually), which will have a greater impact on primary care, where 60% of doctors are over 50 years old (Barber Pérez et al., 2011; Ferrero & Mateo, 2022; Instituto Nacional de Estadística, 2024; Ministerio de Sanidad, n.d.).

The generation of physicians who undertook the implementation and development of the current addiction treatment network during the 1980s and 1990s is now in the process of retirement. This is a generation of doctors, alongside other health and social care professionals, who approach the treatment of addictions from the perspective of health as a whole, at the same time physical, psychological and social. In many cases, they specialise in family medicine or internal medicine; in others, they achieved recognition in the specialty after years of practicing as addiction doctors and requesting validation through the MESTOS system. They have extensive training that includes the management of detoxification, withdrawal drugs, opiate-based maintenance programs, infectious diseases (viral hepatitis, HIV, tuberculosis, etc.), neurological diseases (peripheral neuropathies caused by alcohol, for example), liver disease, and other organic diseases. They have also mastered the diagnosis and treatment of the most frequent psychiatric comorbidities and have a special sensitivity for recognising social problems. In short, they are generalist physicians — in an ample sense of the concept — who have evolved to include mental health skills and knowledge, collaboratively with other colleagues (psychology, nursing, social work and education). Unfortunately, while this generation is leaving, the complexity in caring of these patients remains (MacLean et al., 2018). Consequently, the new generation of addiction physicians must have a wide range of skills and knowledge: communication (motivational interviewing, resistance-management skills),

differential diagnosis and treatment of the most common mental health problems (post-traumatic stress disorder, depression, anxiety, schizophrenia or other forms of psychosis, suicide prevention, etc.) and cognitive deficits, diagnosis of organic comorbidities (HIV, viral hepatitis, sexually transmitted diseases, tuberculosis, pneumonia, cirrhosis, etc.), identification of social problems, management of detoxification and opioid substitution treatment, prevention and diagnosis of withdrawal and intoxication, treatment of patients with pain and opioid use disorder, conducting group therapy, and knowledge of different psychological approaches to withdrawal, use of telemedicine and digital interventions, diagnosis and management of non-substance addictions, management of drugs for nicotine and alcohol withdrawal, as well as off-label drugs for these and other addictions (Arunogiri et al., 2024; Bramness et al., 2024; Nunes et al., 2020).

The new generations of doctors choosing to dedicate themselves to addictions have completed the psychiatry specialty in their medical training (MIR: Médico Interno Residente). The fact that this is one of the few specialties that includes in its mandatory training schedule a minimum of four months of special training in addictions should improve the detection of and approach towards comorbid mental disorders suffered by a high proportion of patients with SUD or other addictions. However, there is some concern that the most “generalist” aspect of addiction management — the medical pathology derived from drug use — is lost in the focus on primary care and specialized care. While the former suffers from understaffing and bureaucracy overload, the latter results in insufficient experience in the treatment of these complications, lack of awareness of the addictions network and disregard for the specific and intrinsic difficulties of these patients. All of this can perpetuate the stigma of patients with SUD and, consequently, make their access to medical treatments more difficult, cause their treatment adherence problems to be underestimated and exclude vulnerable people who do not fit into a hospital health system that is often inflexible (Krendl & Perry, 2023).

Detecting diseases such as HIV, HCV, STDs or alcohol-related peripheral neuropathy, to give just a few examples, must remain the responsibility of addiction doctors, in coordination with professionals from other specialties. These are very prevalent problems that require professionals to feel confident in interpreting tests, electrocardiograms or chest X-rays, among many other complementary examinations. We need psychiatrists who choose dedication to this field to have transversal competences that are traditionally found in other specialties, such as internal medicine or family and community medicine: in many cases the only link with the health system for these patients are the addiction doctors. This does not imply an intrusion into the work of family doctors but rather cooperation; in short, the addiction

doctor adopts a double role combining primary care and specialized care in addictions.

Some initiatives at European level (<https://wave-addictionsworkforce.eu/>) are currently reflecting on the well-being of addiction professionals and on the necessary competencies in terms of knowledge and skills to guarantee a future which maximises dignity and quality in the treatment of people with addictions. Should there be a minimum level of competencies for hiring doctors in addiction treatment centres? Or do we perhaps need a specialty in addiction medicine? Or simply specific training/certification? These are questions open to debate. Spain has various master's degrees, in some cases pioneers at European level, with a comprehensive vision, and they produce excellently trained professionals. However, being aimed at various professional profiles — and in many cases the students are not doctors — they do not go deep enough into addiction medicine to the level that a specialty in the MIR specialized training system would allow. Some countries already have recognized training paths in addiction medicine as a subspecialty or independent certification of the specialty; this approach is therefore not unreasonable. In Europe, 17 out of 24 countries have some type of specific training in addictions that lasts between half a month (Germany) and 72 months (Norway). This includes Spain, with the 12 months of optional training for psychiatric MIRs (Bramness et al., 2024). This training, however, is not mandatory for the practice of addiction medicine in Spain and is not extended to other medical specialties. A proposed specialty in addiction medicine would also open the possibility of having a stronger presence in university medical studies, thus inspiring future generations of doctors.

Nevertheless, if working conditions are not improved, this is not enough to ensure the future of the specialty. To be more specific, a reduction in the workload is required, as well as greater consideration for professionals, a guarantee of professional careers, the promotion of work-family reconciliation and equal financial remuneration with other specialists. Dignifying the figure of the addiction doctor means increasing the workforce that this specialty will have in the future, and means improving the efficiency, quality and safety of the care of patients and their families.

A thorough knowledge of the DSM is not sufficient for the practice of psychiatry, let alone in the field of addictions. This editorial is a call to the Spanish medical and scientific community, and also to other health professionals, to continue working to maintain a legacy of which we should be proud.

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ORIGINAL

Problematic Internet Use among adolescents: Spanish validation of the Compulsive Internet Use Scale (CIUS)

Uso problemático de Internet en adolescentes: Validación en español de la Escala de Uso Compulsivo de Internet (CIUS)

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Abstract

Problematic use of the Internet among adolescents has risen in the last decade. The Compulsive Internet Use Scale (CIUS) is one of the most frequently internationally-used tools developed to assess Problematic Internet Use (PIU). However, evidence concerning its validity and reliability in its Spanish version for the adolescent population is currently lacking. Thus, the main goal of the present study was to analyse the psychometric properties of CIUS scores in a large sample of Spanish adolescents. The sample consisted of 1,790 participants (53.7% female, mean age = 15.70 years old, $SD = 1.26$). The one-dimensional model displayed appropriate goodness of fit indices after error covariance of five items were allowed to correlate. Strong measurement invariance was found for the one-dimensional model across age and gender. The McDonald's Omega coefficient for the total score was 0.91. Furthermore, PIU was positively associated with different indicators of poor wellbeing and psychological difficulties and negatively associated with prosocial behaviour, self-esteem and sense of belonging to the educational centre. The study provided evidence of validity for the CIUS, confirming its utility for screening PIU in non-clinical adolescents.

Keywords: Problematic Internet Use, CIUS, psychometric properties, measurement invariance, adolescence

Resumen

La Escala de Uso Compulsivo de Internet (*Compulsive Internet Use Scale*, CIUS) es uno de los instrumentos más empleados a nivel internacional para evaluar el Uso Problemático de Internet (UPI). Sin embargo, no existen evidencias de validez y fiabilidad de las puntuaciones de la versión española en población adolescente. Por ello, el principal objetivo de este estudio fue analizar las propiedades psicométricas de las puntuaciones de la CIUS en una muestra representativa de adolescentes españoles. La muestra contó con 1.790 participantes (53,7% mujeres, edad media = 15,70 años, $DT = 1,26$). El análisis de la estructura interna del instrumento mostró unos índices de bondad de ajuste apropiados para el modelo unidimensional después de que se permitiera correlacionar la covarianza de errores de cinco ítems. Se encontró invarianza de medición fuerte para el modelo unidimensional en las variables de edad y género. El coeficiente Omega de McDonald para la puntuación total fue 0,91. Además, el UPI se asoció positivamente con diferentes indicadores de malestar y dificultades psicológicas y negativamente con el comportamiento prosocial, la autoestima y el sentido de pertenencia al centro educativo. Este estudio arroja evidencias de validez de la CIUS, y sugiere que puede ser una herramienta apropiada para medir el UPI en adolescentes de la población general.

Palabras clave: Uso Problemático de Internet, CIUS, propiedades psicométricas, invarianza de medición, adolescencia

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Adolescence sees a wide range of physical, psychological, and social changes (McGrath et al., 2016). It entails a period of vulnerability for different psychological and behavioral difficulties, including so-called Problematic Internet Use (PIU) (Fonseca-Pedrero et al., 2021; Rial Boubeta, Golpe Ferreiro, Gómez Salgado & Barreiro Couto, 2015). The number of studies focused on it is rapidly increasing (Moreno, Eickhoff, Zhao, Young & Cox, 2019). Recent studies reveal the relationship between behavioral, emotional, and social difficulties as well as externalizing behavior, boredom, poor mental health, high levels of distress and other substance use disorders with PIU (Díaz-Aguado, Martín-Babarro & Falcón, 2018; Jorgenson, Hsiao & Yen, 2016; Sussman, Harper, Stahl & Weigle, 2018; Pedrero-Pérez et al., 2018). Moreover, a recent study has shown that cyberbullying seems to be associated with both PIU and online behaviors such as sexting, gambling, and contacting strangers (Feijóo, Foody, Norman, Pichel & Rial, 2021).

PIU is defined as a generalized and compulsive use of the Internet associated with a loss of control, and negative consequences for the individual (Caplan, 2002). The need for social contact and reinforcement obtained online produces an increased desire to remain within a virtual social life (Díaz-Aguado et al., 2018). Given that information technologies are frequently used for purposes such as learning, socializing, and professional activities, it is crucial to discover and prevent risks related to technology use. As a result of the degree of interference in the individual's life, different terms are used in the literature, varying from Internet Addiction, Pathological Internet Use, Internet Dependency, Compulsive Internet Use or PIU (Christakis, 2010; Ferreiro, Folgar, Salgado & Boubeta, 2017; Kuss, Griffiths, Karila & Billieux, 2014). It is important to clarify the construct, particularly with regard to measurement, in a wide range of culturally and linguistically diverse contexts, partly to enable comparisons at the international level.

PIU has not yet been recognized by diagnostic classification systems, but it has received increasing research and clinical attention. It is related to a constant preoccupation with the Internet together with an uncontrolled and continued use of the Internet regardless of its negative consequences (Caplan, 2010). The literature included in the present review revealed some of the variables associated with PIU, such as: sleeping and eating disorders, social skills deficits, sedentary lifestyles, family conflicts, and poor school performance (Ferreiro et al., 2017; Rial Boubeta et al., 2015; Vila, Carballo & Coloma-Carmona, 2018). Nevertheless, it is not clear whether it should be considered as a mental disorder or it just reflects other underlying clinical condition (Chamberlain, Ioannidis & Grant, 2018; Vink, Van Beijsterveldt, Huppertz, Bartels & Boomsma, 2016). The

DSM-5 (American Psychiatric Association, 2013) and ICD-11 (World Health Organization, 2018) do not include it. In the last few years, international and national prevalence rates of PIU are high and particularly disturbing among adolescents (Díaz-Aguado et al., 2018; Rial Boubeta et al., 2015). For instance, a cross-sectional study of 14-17-year-old adolescents conducted in seven European countries found a widely variation between countries, from 7.9% in Iceland to 22.8% in Spain (Tsitsika et al., 2014). Durkee et al. (2012) found that up to 4.4% of adolescents from 11 European countries were pathological Internet users and 13.5% maladaptive users. Recent studies suggest that culture is an interesting variable to study (López-Fernández, 2015; Panova, Carbonell, Chamarro & Puerta-Cortés, 2021). Spanish studies variously show percentages of 26.6% (Rial Boubeta et al., 2015), 23.5% (Plan Nacional sobre Drogas -ESTUDES-, 2021), and 16.3% (Gómez, Rial, Braña, Golpe & Varela, 2017).

Increasing research interest has led to the development of numerous scales. Laconi, Rodgers & Chabrol (2014) list more than 45 available questionnaires to measure this construct. Among the different tools, the Compulsive Internet Use Scale (CIUS) (Meerkerk, Van Den Eijnden, Vermulst & Garretsen, 2009) is one of the most frequently internationally adapted instruments for research and practice. The CIUS was found to have adequate psychometric properties in different populations and contexts. Besides its psychometric quality, the CIUS has other important advantages, as it is a short questionnaire with 14 items answered on a 5-point Likert scale easy to answer and understand (López-Fernández et al., 2019; Sarmiento, Zych, Herrera-López, Delgado Sánchez & Oksanen, 2020). Items emerged from the diagnostic criteria listed for substance dependence and gambling in the DSM-IV-R (American Psychiatric Association, 2002), behavioral addictions (Griffiths, 1999; Meerkerk et al., 2009) and obsessive-compulsive disorder (López-Fernández et al., 2019). Several studies have analyzed its reliability and validity (Alavi, Jannatifard, Maracy, Alaghemandan & Setare, 2014; Khazaal et al., 2012; López-Fernández et al., 2019; Van den Eijnden, Spijkerman, Vermulst, van Rooij & Engels, 2010). For instance, López-Fernández et al. (2019) reported its psychometric properties across eight languages (2019). Khazaal et al. (2012) indicated that the one-factor solution fitted the data well. In addition, Meerkerk et al. (2009) revealed the measurement invariance (MI) of the instrument across variables such as gender. Worth noting, Meerkerk et al. (2009) revealed a one-dimensional structure after correlating the error variances of different items. It showed excellent psychometric properties in adaptations and validations in various languages and countries, including French (Khazaal et al., 2012), Portuguese (Sales, Silva, Lopes & Silva, 2018), German (Wartberg, Petersen, Kammerl, Rosenkranz & Thomasius, 2014), Japanese

(Yong, Inoue & Kawakami, 2017) and Chinese (Dhir, Chen & Nieminen, 2015).

In this research context, the main goal of this paper was to analyze the psychometric properties of the Spanish version of the CIUS in a representative sample of adolescent. Therefore, the specific objectives were a) to estimate the prevalence of PIU; b) to analyze the internal structure of the CIUS; c) to estimate the reliability of the CIUS scores; d) to study the MI of the CIUS across gender and age; and e) to analyze the relationship between the PIU and other indicators of mental health, well-being, and socio-emotional adjustment.

Method

Participants

Stratified random cluster sampling, with the classroom as the sampling unit, from a population of 15,000 students in the region of La Rioja (northern Spain) was conducted in the year 2019. The layers were created as a function of the geographical zone and the educational stage.

An initial sample was composed of 1,972 students. Those students with a high score in the Oviedo Infrequency Scale-Revisited (Fonseca-Pedrero, Lemos-Giráldez, Paino, Villazón-García & Muñiz, 2009; Fonseca-Pedrero, Pérez-Albéniz, Díez-Gómez, Ortuño-Sierra & Lucas-Molina, 2019) (two or more points) ($n = 146$) or an age higher than 19 years-old ($n = 36$) were eliminated. Thus, the final sample was composed of 1,790 students, 816 men (45.6%), 961 women (53.7%), and 13 (0.7%) with gender diversity. Mean age was 15.70 years-old ($SD = 1.26$).

Instruments

The Compulsive Internet Use Scale (CIUS) (Meerkerk et al., 2009). The CIUS has 14 items on a five-point Likert scale. It covers five dimensions: loss of control (items 1, 2, 5, and 9), preoccupation (items 4, 6, and 7), withdrawal symptoms (item 14), coping or mood modification (items 12 and 13) and conflict (items 3, 8, 10, and 11). In this study we administered the Spanish version used in the ESTUDES (2021).

The Adolescent Behavioral Suicide Scale (SENTIA) (Díez-Gómez, Ortuño-Sierra, Pérez de Albéniz & Fonseca-Pedrero, 2020). The SENTIA scale is a self-report instrument developed to screen for suicidal behavior in adolescents. The extended version is formed by 16 items in a dichotomous format (yes/no). Previous studies have shown that the SENTIA scores have adequate psychometric properties (Díez-Gómez et al., 2020).

The Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997), self-reported version. The SDQ is composed of a total of 25 statements distributed across five subscales. It has a three-point Likert-type response format. The Spanish version translated and validated of the SDQ (Ortuño-

Sierra, Chocarro, Fonseca-Pedrero, Riba & Muñiz, 2015) was used in the present study.

The Rosenberg Self-Esteem Scale (RSE) (Rosenberg, 1965). This instrument is a one-dimensional scale that measures self-esteem. The scale has 10 items that all use a four-point Likert scale. The Spanish version with adequate psychometric properties has been used in the present study (Martín-Albo, Núñez, Navarro & Grijalvo, 2007).

The Reynolds Adolescent Depression Scale Short Form (RAD-SF) (Reynolds, 2002). The RAD-SF is a self-report tool for screening depressive symptoms in adolescents. It has 10 items that all use a four-point Likert scale. The Spanish version, adapted and validated for adolescents of the instrument, was used (Ortuño-Sierra et al., 2017).

The Prodromal Questionnaire-Brief (PQ-B) (Loewy, Pearson, Vinogradov, Bearden & Cannon, 2011). The PQ-B consists of 21 dichotomous items (true/false) and two additional Likert scale questions that screen for psychosis-risk. Previous studies have shown adequate psychometric properties of the instrument (Fonseca-Pedrero, Gooding, Ortuño-Sierra & Paino, 2016).

The Maryland Safe and Supportive Schools Climate Survey (MDS3) (Bradshaw, Waasdorp, Debnam & Johnson, 2014). This multidimensional measure of school climate contains 56 items and was developed by the Johns Hopkins Center for Youth Violence Prevention measures Safety, Engagement in school, and Environment. For the present study, we chose 14 items that use four point Likert scales as previously used in a Spanish language context (Díez-Gómez et al., 2020).

The Oviedo Infrequency Scale-Revisited (INF-OV-R) (Fonseca-Pedrero et al., 2009; Fonseca-Pedrero et al., 2019). This scale aims to detect pseudorandom or dishonest responding using 10 items on a 5-point Likert scale. Students with two or more incorrect responses on the INF-OV-R scale were eliminated from the sample.

Procedure

The present study was approved by the Ethical Committee of Clinical Research of La Rioja. With the aim to standardize the administration process, all researchers followed a protocol throughout. The questionnaires were filled out on computers and in groups of 10 to 30 students. Participants were informed about the voluntary nature of the study. Informed consent was obtained from parents or legal guardians.

Data analysis

First, we calculated the descriptive statistics and the percentage distribution of the CIUS items. Second, with the aim of gathering evidences about the internal structure of the questionnaire, we conducted two different confirmatory factor analysis (CFA) attending to the models proposed by Meerkerk et al. (2009) and following the guidelines provided by Ferrando, Lorenzo-Seva, Hernández-Dorado & Muñiz

(2022). The parameters were obtained from Muthén's quasi-likelihood estimator (Muthén & Muthén, 1998). Then, to test MI, successive multigroup CFAs were conducted. Delta parameterization was used (Muthén & Muthén, 1998). Fourth, we analyzed the internal consistency of the scores. To this end, McDonald's Omega was calculated. Finally, we analysed the sources of validity evidence of the CIUS with external variables. SPSS 17.0 (IBM Analytics, 2016) and JASP Team (2019) were used for data analyses.

Results

Descriptive statistics and prevalence rates

Table 1 shows descriptive statistics of the CIUS for the final sample. In addition, Table 1 includes the percentages of the different answers' options for the CIUS.

Evidence of validity based on internal structure of the CIUS

We tested a one-dimensional model in the CFA. As shown in Table 3, goodness-of-fit index were poor with CFI and

RMSEA values under .90 and over .10 respectively. We then examined the model proposed by Meerkkerk et al. (2009), allowing the error variances of items 1 and 2, 6 and 7, 8 and 9, 10 and 11, and 12 and 13. As shown in Table 3, the inclusion of this error correlation displayed adequate goodness-of-fit indices, with CFI values over .90 and RMSEA values around .08.

Measurement invariance of the CIUS scores across gender and age

With the aim of examining MI across age, the sample was divided into two subgroups (14–16-year-olds and 17–18-year-olds), according to the stages of the Spanish educational system (compulsory/post-compulsory). Strong invariance for gender and age was confirmed (see Table 2).

Estimation of the reliability of the CIUS scores

The McDonald's Omega coefficient for the total score of the CIUS was 0.91. All the discrimination indices were over .30.

Table 1

Prevalence and Descriptive statistics of the Compulsive Internet Use (CIUS) for the total sample

Item	Prevalence (%)					Descriptive Statistics			
	Never	Rarely	Sometimes	Often	Very Often	Mean	SD	Skewness	Kurtosis
1	9.6	32.3	34.9	17.8	5.4	1.77	1.02	0.24	-0.45
2	28.2	29.7	25.3	12.2	4.6	1.35	1.15	0.51	-0.59
3	15	26.4	31	18.4	9.2	1.81	1.17	0.17	-0.78
4	30.4	39.8	21.1	6.6	2	1.10	0.98	0.75	0.18
5	24.7	32.2	24.6	12.9	5.6	1.42	1.16	0.50	-0.57
6	33.5	41.1	17.4	7.2	0.9	1.01	0.94	0.77	0.07
7	11.2	33.1	37.9	14.5	3.2	1.66	0.97	0.21	-0.29
8	11.5	25.8	34.5	19.9	8.3	1.88	1.11	0.10	-0.65
9	32.9	34.9	23	6.5	2.7	1.11	1.02	0.74	0.04
10	28	34.7	24.2	9.9	3.2	1.26	1.07	0.60	-0.30
11	33.2	35.2	20.7	8.2	2.6	1.12	1.05	0.75	-0.07
12	14.5	22.9	29.4	23.1	10.1	1.91	1.20	0.01	-0.90
13	21.8	25.1	24.5	19.8	8.9	1.69	1.26	0.21	-1.01
14	43.1	35.8	14.6	4.4	2.1	0.87	0.96	1.14	1.02

Table 2
Goodness of fit indices for the hypothetical models tested and measurement invariance across gender and age

Model	χ^2	df	CFI	TLI	RMSEA (IC 90%)		AIC	BIC	Δ CFI
						SRMR			
1 factor	2309.348	77	.774	.733	.012 (.123-.132)	.066	66932.549	67163.128	
1 factor + CE	662.264	72	.94	.925	.068 (.063-.072)	.039	65295.465	65553.494	
Measurement Invariance									
Gender									
Male (n = 816)	1344.970	72	.932	.914	.068 (.061-.075)	.043	29862.363	30083.471	
Female (n = 961)	401.333	72	.944	.929	.069 (.062-.075)	.039	35312.734	35542.16	
Configural invariance	746.303	144	.939	.923	.068 (.064-.073)	.041	65175.097	65691.154	
Metric invariance	772.991	158	.937	.928	.066 (.061-.071)	.05	65173.786	65612.984	-.01
Scalar invariance	924.159	171	.923	.918	.070 (.066-.075)	.056	65298.953	65666.781	-.01
Age									
14-15 years old (n = 883)	662.264	72	.94	.925	.068 (.063-.072)	.042	65267.465	65448.634	
16-18 years old (n = 907)	417.823	72	.928	.901	.073 (.066-.080)	.047	33267.809	33426.543	
Configural invariance	736.278	144	.94	.924	.068 (.063-.071)	.041	65303.878	65819.935	
Metric invariance	751.801	158	.94	.931	.065 (.060-.069)	.045	65291.401	65730.444	-.01
Scalar invariance	800.768	171	.936	.932	.064 (.060-.069)	.047	65314.368	65682.196	-.01

Note. χ^2 = Chi square; df = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; IC = Interval Confidence; SRMR = Standardized Root Mean Square Residual; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; Δ CFI = Change in Comparative Fit Index.

Table 3
Factor Loadings for the one-dimensional model with five correlated errors

Item	Factor Loadings	SE	CI 95%	
			Lower	Upper
1	0.666	0.023	0.621	0.711
2	0.752	0.026	0.701	0.802
3	0.682	0.027	0.629	0.735
4	0.511	0.023	0.466	0.556
5	0.649	0.027	0.596	0.701
6	0.543	0.022	0.501	0.586
7	0.615	0.022	0.572	0.658
8	0.588	0.026	0.536	0.639
9	0.671	0.023	0.625	0.716
10	0.686	0.024	0.638	0.733
11	0.659	0.024	0.613	0.706
12	0.635	0.028	0.580	0.690
13	0.658	0.030	0.600	0.716
14	0.614	0.022	0.571	0.656

Note. SE = Standard Error; CI = Confidence Interval.

Table 4
Pearson's Correlation Matrix between the Compulsive Internet Use (CIUS) scores and different indicators of well-being and mental health

Well-Being and mental health variables	CIUS
Suicidal Behaviors (SENTIA)	0.301*
Psychotic-like Experiences (PQ-B)	0.330*
Depressive symptoms (RADS-SF)	0.396*
Emotional Problems (SDQ)	0.340*
Behaviors Problems (SDQ)	0.231*
Peer Problems (SDQ)	0.158*
Hyperactivity (SDQ)	0.251*
Prosocial Behaviors (SDQ)	-0.127*
Self-Esteem (RSE)	-0.353*
Feeling of belonging (MDS3)	-0.170*

Note. * $p < 0.01$ SENTIA = Adolescent Behavioral Suicide Scale; PQ-B = Prodromal Questionnaire-Brief; RADS-SF = Reynolds Adolescent Depression Scale Short Form; SDQ = Strengths and Difficulties Questionnaire; RSE = Rosenberg Self-Esteem Scale; MDS3 = Maryland Safe and Supportive Schools Climate Survey.

Evidence of validity based in relationships with other variables: Relation of the Problematic Internet Use with Well-Being and mental health indicators

The correlation between CIUS scores and different indicators of socio-emotional adjustment was studied. Results are depicted in Table 4. CIUS scores were positively associated with suicidal behavior, depressive symptoms, emotional and behavioral problems, and psychotic-like experiences. Moreover, CIUS scores were negatively correlated with self-esteem, prosocial behavior, and the feeling of belonging to the educational center.

Discussion

Problematic Internet Use (PIU) has received an increasing amount of attention in the last years. Recent research have found that internet use has almost doubled in the last decade among children across different European countries (Smahel et al., 2020). In addition, adolescence is a critical developmental stage in which different psychological difficulties may arise and even worsen into adulthood (Fonseca-Pedreto et al., 2021; McGrath et al., 2016). Thus, PIU screening is very relevant at this developmental timepoint.

Results found in the present study reveal that adolescents have moderate prevalence rates for PIU. Adolescents indicated compulsive internet use *often* and *very often* in several items of the CIUS. Previous studies revealed similar data among Spanish adolescents. For instance, the national prevalence study showed percentages about 23.5% (ESTUDES, 2021). Similarly, the study of Gómez et al. (2017) found a percentage of 16.3% for PIU. Prevalence rates in international studies are somehow similar. For example, the cross-sectional study conducted by Tsitsika et al. (2014) in seven European countries revealed prevalence rates between 7.9% and 22.8%.

In terms of factorial structure, the results of the CFA showed that the CIUS was basically one-dimensional. Similar to our results, previous research have revealed a one-dimensional structure both in adults (Khazaal et al., 2012; López-Fernández et al., 2019; Meerkerk et al., 2009; Yong et al., 2017) and adolescents (Dhir et al., 2015; Mak et al., 2014). For example, the study of López-Fernández et al. (2019) indicated that the CIUS was basically one-dimensional across eight languages. Nonetheless, it is worth noting that the one-dimension structure revealed poor goodness-of-fit indices, and adequate fit was only reached after error terms of different items were allowed to correlate.

The present study provided evidence of strong MI by gender and age, suggesting factorial equivalence by these characteristics. These results are similar to other studies that have found total factorial equivalence of the CIUS across different groups including gender or internet use

(Meerkerk et al., 2009). The study of MI across age and gender provides essential evidence of construct validity for the CIUS scores in a developmental stage, like adolescence, where relevant biopsychological changes occur across the stage and are different for males and females.

Attending to the evidence of relation with other variables, the results found reveal that the CIUS scores were statistically significant associated with different indicators of mental health, including psychotic-like experiences, depressive symptoms, and suicidal behavior (positive correlation). Also, statistically significant correlations were found between the CIUS and indicators of well-being such as emotional difficulties, behavioral problems, as well as prosocial behavior. A negative correlation was found for self-esteem and feeling of belonging. It may indicate that they act as protective factor (Mei, Yau, Chai, Guo & Potenza, 2016). Previous studies have also shown the relation between problematic internet use and depressive symptoms and insomnia (Jain et al., 2020), anxiety (Lee & Stapinski, 2012), mood symptoms (Gao et al., 2020), attention deficit hyperactivity disorder (Cakmak & Gul, 2018), substance abuse and suicidal behavior (Bousño Serrano et al., 2017). Considering the special relevance of this developmental stage, results are of particular interest. Prevention strategies should focus on detecting problematic internet use among adolescents, as it is a variable related with different psychological difficulties that are diminishing adolescents' well-being. With this regard the evidence found in this work may also have relevant implications, for instance in clinical fields. In general, it can be affirmed that psychological treatments have been shown to be efficient and effective for a wide range of psychological disorders in a variety of contexts (Fonseca-Pedrero et al., 2021). Considering that the PIU is increasing in adolescence, and the fact that CIUS's scores are statistically significant correlated with measures of depression, suicidal ideation or psychotic-like experiences, screening for PIU could be relevant with clinical purposes.

The present study has some limitations. First, there are problems inherent to any research based on questionnaires. Thus, future works may benefit of the use of experimental data from other levels of analysis (neuroimaging, neurocognition, etc.). Second, the cross-sectional nature of the study precludes establishing cause-effect correlations, and future longitudinal studies could analyze this aspect. Finally, given the peculiarities and diversity of the country, future studies should examine the psychometric properties of the instrument in other regions and/or geographic areas.

Notwithstanding these limitations, results found in the present study have clear implications for the use of the CIUS in adolescents. Previous studies have confirmed the psychometric adequacy of the CIUS across other languages and countries. Nonetheless, this study contributes

to the evidence of reliability and validity of the CIUS in its Spanish version and in adolescents' populations. Moreover, future research should continue gathering new validity evidence of the CIUS for its use with adolescents. Screening for problems such as Internet abuse in a relevant developmental stage like adolescent could provide relevant information to prevent a problematic that is reaching serious levels.

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Conflict of interests

Authors declare that they have no conflict of interest.

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ORIGINAL

Cannabis use in adult population in Galicia: Prevalence and associated characteristics

Consumo de cannabis en población adulta en Galicia: Prevalencias y características asociadas

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Abstract

Cannabis is the most widely consumed illegal drug in Spain, with consumption concentrated mainly in adolescence and early adulthood. The objectives were to estimate the prevalence of cannabis use, cannabis use disorder (CUD) and dependent use in the Galician population aged 16 years and over, and to characterize cannabis users and cannabis dependent users. Data are from two cross-sectional studies from the Risk Behavior Information System conducted in 2017 ($n = 7,841$) and 2018 ($n = 7,853$). The Cannabis Abuse Screening Test (CAST) was used to identify users with CUD and/or dependent use. Prevalences were estimated and regression models were fitted to identify variables associated with cannabis use and dependent use. In 2017-2018, 2.7% (95% CI: 2.5-3.0) of the Galician population aged 16 years and over consumed cannabis at the time of the survey, with this prevalence being 9% in the 16-24 years age group. Prevalence decreased with age and was higher in males in all age groups. The prevalence of CUD in users was 69.5% (95% CI 61.1-78.1) and of dependent use it was 49.2% (95% CI 46.6-53.9). Tobacco use was the major determinant of being a cannabis user [OR = 19.8 (95% CI 13.8-28.4)] and daily cannabis use of being a dependent user [OR = 5.5 (95% CI 3.2-9.5)]. Cannabis use among the Galician population is high, especially among young people aged 16-24 years, who show the highest probability of dependent use. Prevention measures should be aimed especially at the younger population aged 16 years to curb its use and the development of consequences such as CUD and dependent use.

Keywords: cannabis, cannabis use disorder, dependence, prevalence, adult

Resumen

El cannabis es la droga ilegal más consumida en España con un consumo que se concentra principalmente en la adolescencia y primeros años de la edad adulta. Los objetivos de este estudio fueron estimar la prevalencia de consumo de cannabis, de trastorno por consumo de cannabis (CUD) y de consumo dependiente (CD) en la población gallega ≥ 16 años y caracterizar a los consumidores y a los consumidores dependientes. Los datos proceden de dos estudios transversales del Sistema de Información sobre Conductas de Riesgo realizados en 2017 ($n = 7.841$) y 2018 ($n = 7.853$). Se utilizó el test de adicción al cannabis (CAST) para identificar a los consumidores con CUD y/o CD. Se estimaron prevalencias y se ajustaron modelos de regresión para identificar variables asociadas al consumo y CD de cannabis. El 2,7% (IC 95%: 2,5-3,0) de la población gallega ≥ 16 años consumía cannabis en el momento de la encuesta (2017-2018), siendo esta prevalencia del 9% en el grupo de 16-24 años. La prevalencia disminuye con la edad y es superior en hombres en todos los grupos etarios. La prevalencia de CUD en los consumidores fue del 69,5% (IC 95% 61,1-78,1) y de CD del 49,2% (IC 95% 44,6 -53,9). Consumir tabaco es el mayor determinante para ser consumidor de cannabis [OR = 19,8 (IC 95% 13,8-28,4)] y consumir diariamente cannabis para ser consumidor dependiente [OR = 5,5 (IC 95% 3,2-9,5)]. El consumo de cannabis entre la población gallega es bajo, aunque entre los jóvenes de 16-24 años, que son los que muestran más probabilidad de CD, la prevalencia es elevada. Las medidas de prevención deben dirigirse especialmente a la población más joven de 16 años para frenar su consumo y el desarrollo de consecuencias como el CUD y el CD.

Palabras clave: cannabis, trastorno por consumo de cannabis, dependencia, prevalencia, adulto

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Cannabis is the most widely used illicit drug in Europe. According to data from the latest report by the European Monitoring Centre for Drugs and Drug Addiction, in 2021 the prevalence of cannabis use in the previous year was 7.7% in Europe, a prevalence five times higher than that of other illicit substances (European Monitoring Centre for Drugs and Drug Addiction, 2021). Continuous use of cannabis can lead to the development of mental illness, respiratory and cardiovascular diseases (Cohen, Weizman & Weinstein, 2019), and early onset is associated with suicidal ideation, depression, or schizophrenia (Gobbi et al., 2019; Godin & Shehata, 2022). In addition, it is during adolescence and in the first years of adult life that cannabis use prevalence is higher (Observatorio Español de las Drogas y las Adicciones, 2020).

Recent decades have seen changes in the legal and social frameworks around cannabis. At the legal level, several countries, including Canada and 18 federal states of the United States (USA), have legalized its use in the adult population for recreational purposes. This legislative change has caused a decrease in the risk perception associated with cannabis and a rise in the prevalence of its use (Carliner, Brown, Sarvet & Hasin, 2017; Kondo et al., 2019; Levy, Mauro, Mauro, Segura & Martins, 2021). In fact, between 2002 and 2014 in the USA, the prevalence of perceived high risk fell by more than 17 percentage points and the prevalence of perceived no risk rose by almost 10 points (Carliner et al., 2017). Moreover, the increase in the prevalence and acceptance of cannabis use has led to a dramatic increase of its availability on the market (Kondo et al., 2019).

In Spain, where cannabis use is currently not legal, perception of the risk associated with use in the adult population increased by 3.8 percentage points between 2017 and 2019 among regular users (81.5% and 85.3 %, respectively) and remains stable among occasional users (66.1% and 66.3%, respectively) (Observatorio Español de las Drogas y las Adicciones, 2020). Nevertheless, among the youngest, risk perception has decreased in parallel with the increase in the prevalence of use in recent years (Observatorio Español de las Drogas y las Adicciones, 2021).

In Spain, the EDADES study (Survey on Alcohol and other Drugs in Spain) has been monitoring the development of drug use in the population aged 15 to 64 years since 1995. The information provided by this study has cannabis as the most used illicit substance in Spain. In 2019-2020, the last year for which information is available, the prevalence of lifetime consumption reached a historic maximum, with 37.5% of Spaniards reporting that they had used cannabis at some time in their lives. The prevalence of use in the previous month decreased from 9.1% in 2017 to 8.0% in 2019-2020, and that of daily use increased to 2.9%, having remained stable in 2015 and 2017 (2.1%). Cannabis use

is more prevalent among men and decreases with age. In Spain, it begins at 18.5 years of age (18.1 years in men and 19.1 in women), making it the illicit drug with the earliest age of onset (Observatorio Español de las Drogas y las Adicciones, 2020).

The detailed characterization of cannabis use and the description of types of users and their patterns of use is essential for planning public health policies. In Galicia, until now, EDADES was the only available source for studying the epidemiology of cannabis in the adult population. Although this study reports basic information on the characteristics of cannabis use, the limited size of the sample in each Autonomous Community does not allow a detailed analysis based on the different characteristics associated with use. In addition, the age limit of the study population is 64 years.

The objectives of this study were to estimate the prevalence of cannabis use (global, daily and occasional), the prevalence of cannabis use disorder and dependent use in the Galician population aged 16 years and over, as well as to characterize users and dependent users.

Methods

Study design and population

The Risk Behaviours Information System (SICRI) focuses on conducting quasi-annual cross-sectional studies on representative samples of the population aged 16 and over living in Galicia, using a CATI system (computer-assisted telephone interview) (Servicio Galego de Saúde, 2005).

The 2017 and 2018 surveys (SICRI 2017-2018) were designed to ensure representativeness of the population by gender and age groups: 16 to 24, 25 to 44, 45 to 64, and 65 and over. Stratified random sampling was used, with the health card database, covering approximately 98% of the resident population, used as a sampling frame. Field work was carried out between January and December 2017 and October and November 2018.

Procedure

Specific questions were included allowing the prevalence of cannabis use to be estimated. Use was attributed to an affirmative answer to the question “Do you smoke cannabis or marijuana?”. Those who answered affirmatively were asked about the frequency of use: daily, at least once a week, a few days a month or less than once a month.

Instruments

Using the cannabis addiction test CAST, an acronym for the *Cannabis Abuse Screening Test* (Legleye et al., 2015), those with a cannabis use disorder (CUD) and dependent users were identified. The CAST has high internal consistency (Cronbach's Alpha = 0.74) (Legleye et al., 2015) and has been validated in the Spanish population, also with high

internal consistency (0.75) and construct validity with a good fit with two latent factors (Cuenca-Royo et al., 2012). The CAST comprises six questions that assess the frequency of different events associated with cannabis use in the last 12 months: smoking before midday; smoking alone; memory problems when using; disapproval from relatives or friends; intention to reduce or stop consumption; and social problems such as arguments or accidents linked to consumption. All questions have five response options: never (0 points), rarely (1 point), sometimes (2 points), quite often (3 points) and very often (4 points). The total score ranges from 0 to 24 points, and a person with 3 or more points on the CAST has a CUD and a person with 5 or more points is classified as a dependent user (Legleye et al., 2015).

For the characterization, Internet use was classified with the CERI questionnaire (Questionnaire of Internet Related Experiences), validated in the Spanish population. The CERI classifies those with a score <18 points as normal Internet users, and those with 18 or more points as risky or problematic use (Beranuy, Chamarro, Graner & Carbonell, 2009).

Data analysis

To characterize users, sociodemographic, health status, and behaviour-related variables were analyzed. Sociodemographic variables analyzed were: gender (men, women), age group (16-24, 25-44, 45 and over); country of birth (Spain, another country); area of residence (rural, semi-urban and urban); employment status at the time of the survey (employed, unemployed, housework, pensioner or student); educational level (basic: primary education or less, intermediate: secondary education, and higher: university); and living together with a partner (yes, no). Regarding health status variables, the analysis included self-perception of health status at the time of the survey (very good, good, normal and bad/very bad) and the weight status according to the Body Mass Index (BMI) classified as underweight (<18.5 kg/m²), normal weight (18.5-24.9 kg/m²), overweight (25.0-29.9 kg/m²), and obese (≥30 kg/m²). Finally, the variables related to risk behaviours were current tobacco use (smoker, ex-smoker, never smoker), alcohol use in the last 4 weeks (yes, no), and Internet use (no use, normal use, problematic or risky use).

The prevalence of global, daily and occasional cannabis use was estimated by gender, age group and tobacco smoking at the time of the interview and the prevalence of CUD and dependent users in the general population and in users.

The adjusted odds ratios (OR) of being a cannabis user or a dependent user were estimated using two multivariate logistic regression models that included sociodemographic, health status, and behaviour-related variables that were significantly associated with the response variable ($p < 0.05$).

The analysis was performed with Stata v14.2 and sample design was taken into account in the calculations. Both prevalence and OR are presented with 95% confidence intervals (95% CI).

Results

In the SICRI-2017, 7,841 people aged 16 and over living in Galicia were interviewed, and in the SICRI-2018, 7,853 people were interviewed (total sample: 15,694). The response rate was 78% in 2017 and 70% in 2018.

The prevalence of cannabis use in Galicia in 2017-2018 was 2.7% (95% CI 2.5-3.0), and was higher in men [men: 4.2% (95% CI 3.7-4.6) vs. women: 1.4% (95% CI 1.2-1.6)]. Prevalence decreased with age: 8.7% (95% CI 7.8-9.6) in the population aged 16 to 24 years, 5.1% (95% CI 4.4-5.7) in the population aged 25 to 44 years, and 1.5% (95% CI 1.1-1.9) in those aged 45 years or above. In the population over 64 years of age, the prevalence of use was practically nil, in both men and women. The highest prevalence was observed in men aged 16-24 years [11.3% (95% CI 9.9-12.8)] and 25-44 years [7.5% (95% CI 6.3-8.7)] and in women aged 16-24 years [5.9% (95% CI 4.8-6.9)] (Figure 1). Cannabis use was closely linked to tobacco use, with cannabis use prevalence in smokers at 10.7% (95% CI 9.1-12.2), as opposed to 1.1% in ex-smokers (95% CI 0.7-1.5) and 0.4% in never smokers (95% CI 0.2-0.6).

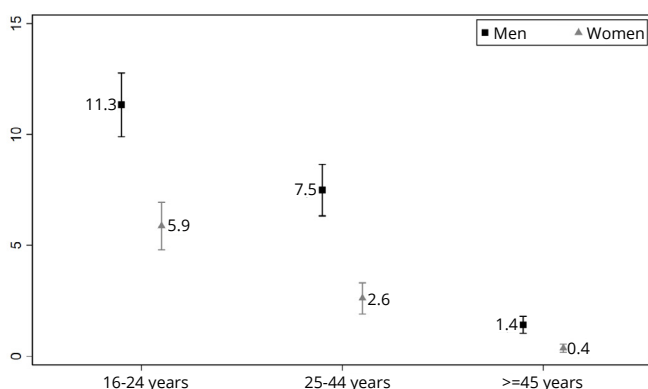
Considering the frequency of use, 2.0% (95% CI 1.7-2.2) of the population reported that they used cannabis occasionally compared to 0.7% (95% CI 0.6-0.9) reporting daily use. The prevalence of use, both occasional and daily, was higher in men. The two age groups in which users were concentrated (16-24 and 25-44 years old) had similar daily use prevalence, although the prevalence of occasional use was twice as high in users aged between 16 and 24 years (Table 1).

CUD was found in 1.9% (95% CI 1.6-2.2) of the Galician population, with 1.3% (95% CI 1.2-1.5) being dependent users. By gender, the percentage of men with CUD was four times higher than in women [(men: 1.5% ($n = 233$) vs. women 0.4% ($n = 66$)]). Restricting this analysis to cannabis users, the prevalence of CUD and dependent use was 69.5% (95% CI 61.1-78.1) and 49.2% (95% CI 44.6- 53.9), respectively.

The probability of using cannabis increased with being male, aged between 16 and 44 years, living in an urban environment, not living with a partner, having poor or very poor self-perceived health status, being underweight, being a smoker or ex-smoker, drinking alcohol and having problematic internet use (Figure 2). On the other hand, the risk of being a dependent cannabis user was linked to being male, aged between 16 and 44 years, with a BMI of below 25 kg/m², being a smoker and using cannabis daily (Figure 3).

Figure 1

Prevalence and 95% confidence intervals of cannabis use by gender and age group (16-24, 25-44, 45 and over)

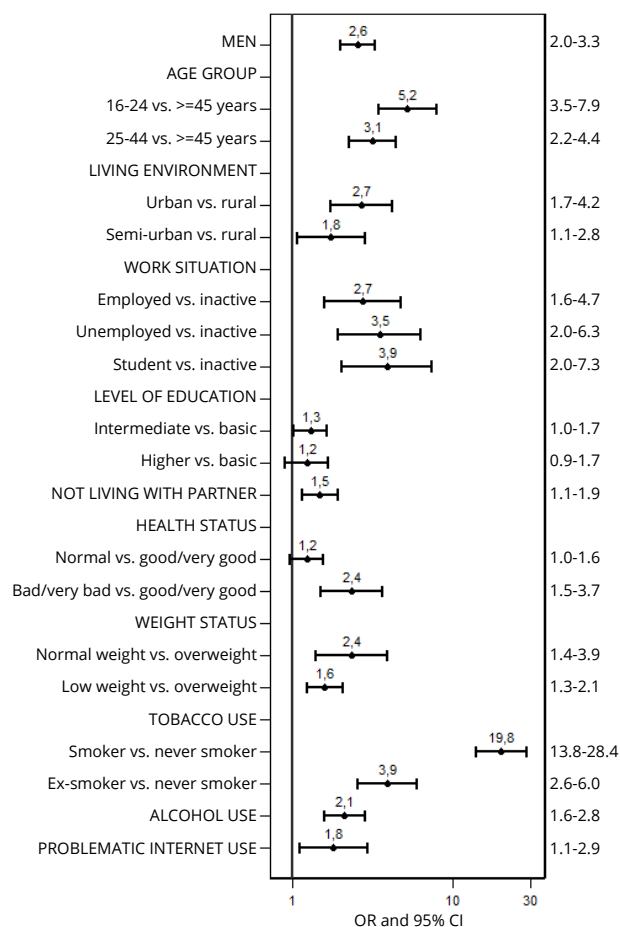
**Table 1**

Prevalence of daily and occasional cannabis use in the Galician population aged 16 years and over, by gender and age group, and in tobacco smokers. Prevalences are shown with 95% confidence intervals (95% CI)

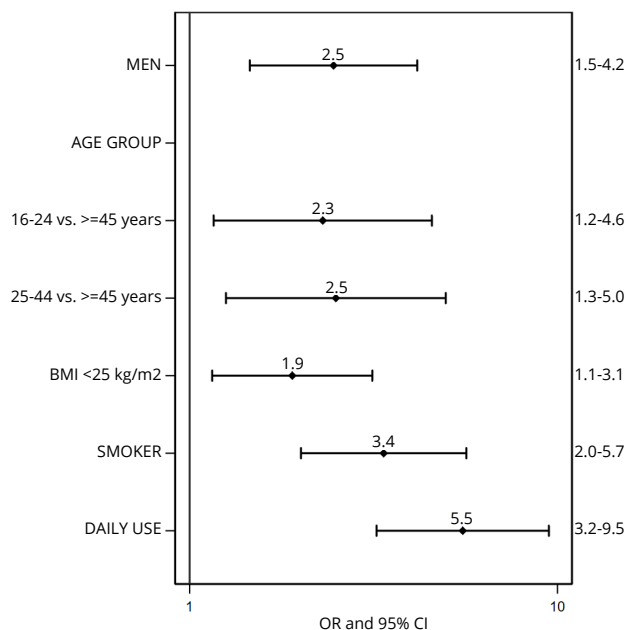
	Daily cannabis use			Occasional cannabis use		
	%	IC 95%		%	IC 95%	
Global	0.8	0.6	0.9	2.0	1.7	2.2
Men	1.2	1.0	1.5	2.9	2.5	3.3
Women	0.3	0.2	0.4	1.1	0.9	1.3
16-24 years	2.5	2.0	3.0	6.2	5.4	7.0
25-44 years	1.5	1.1	1.9	3.5	3.0	4.1
Tobacco smoker	3.4	2.8	4.0	7.0	6.1	7.9

Figure 2

Characteristics associated with cannabis use in the Galician population aged 16 years and over. Odds ratios (OR) and their 95% confidence intervals (95% CI)

**Figure 3**

Characteristics associated with dependent cannabis use in Galician users aged 16 years and over. Odds ratios (OR) and their 95% confidence intervals (95% CI)



Discussion

In 2017-2018, 2.7% of Galicians aged 16 and over used cannabis at the time of the survey, with men aged 16 to 24 years being the group with the highest prevalence of use. CUD was found in 69.5% of Galician cannabis users, with 49.2% being dependent users. Being male, aged between 16 and 44 years, with a BMI of below 25 kg/m² and being a tobacco smoker increased the probability of being both a cannabis user and a dependent consumer.

Approximately three in every 100 Galicians aged 16 years and over reported using cannabis on a daily and occasional basis at the time of the survey. This value was lower than the prevalence of use in the previous month estimated by EDADES in 2017 in the population aged 15 to 64 for Spain (9.1%) and Galicia (7.0%) (Observatorio Español de las Drogas y Adicciones, 2019). Restricting the population age range in our study 16-64 years (similar age range to that of the EDADES study), a prevalence of 3.8% (95% CI 3.4-4.1) was obtained. Both the prevalence of use estimated by EDADES and in the present study show Galicia below the national average (Observatorio Español de las Drogas y las Adicciones, 2019).

In order to compare the results of this study with the EDADES estimates for Galicia, three methodological aspects of both studies must be taken into account. Firstly, the target population of EDADES is aged between 15-64 years, while the SICRI includes the population aged 16 and over. Moreover, the time period referring to cannabis use is different, with EDADES asking about use in the previous month, while SICRI asks about current use, that is, at the time of the survey. Finally, the techniques used to carry out the survey differ in both studies. In EDADES, the questionnaire is self-completed at the respondent's home in the presence of a field worker, although the latter does not have access to the participant's answers. In the SICRI, the collection of information is carried out through a telephone survey. The fact that the questions in the SICRI are asked directly by the interviewer may result in an underestimation of the prevalence of use associated with the concealment of information.

Many of the studies estimating the prevalence of cannabis use are carried out in the young population, and it is infrequent that use is assessed in people over 64 years of age. Both in this and previous studies (Hasin et al., 2015; Mauro et al., 2018), the prevalence in the population over 64 years of age was anecdotal. In Spain, it may be associated with the fact that cannabis use became popular in the 1970s among the younger population (Fuente et al., 2006). On the other hand, Manthey, Freeman, Kilian, López-Pelayo & Rehm (2021) observed that, despite the fact that the prevalence of use is higher in younger adults, there was an increase in the prevalence of use in middle-aged adults (35-64 years) in Spain during the period 2010-2019. It is important to note that as the population ages,

the number of middle-aged users could increase. For this reason, primary prevention and detoxification treatments should also be aimed at this population.

Continued use of cannabis is associated with disorders such as CUD (Hasin, Shmulewitz & Sarvet, 2019), defined as "the inability to stop using cannabis even when it is causing physical or psychological harm" (Connor et al., 2021). It is estimated that more than 22 million people in the world meet CUD criteria, of which 15 million are men (GBD 2016 Alcohol and Drug Use Collaborators, 2018). In European countries such as the United Kingdom or France, the prevalence of CUD in 2019 was approximately 2%, while in Germany or Sweden it did not exceed 1% (Kroon, Kuhns, Hoch & Cousijn, 2020), and in the United States it was estimated at 2.6% (Hasin et al., 2016). In Galicia, the prevalences are lower. One of the reasons for these differences may be the legislative measures each country applies in relation to cannabis use (Kroon et al., 2020).

CUD prevalence is higher in men (Hasin et al., 2019; Kerridge, Pickering, Chou, Saha & Hasin, 2018). One explanation may be that, although men start using cannabis earlier and the probability of developing CUD is therefore greater than in women, in the latter the time between the first use of cannabis and the development of CUD is shorter. This phenomenon is known as the telescopic effect and, as in cannabis, it is also observed in the use of other substances (Hernandez-Avila, Rounsaville & Kranzler, 2004; Sherman, Baker & McRae-Clark, 2016).

One of the issues involved in describing problems associated with cannabis use is the great heterogeneity that exists both in the terminology and the instruments used for diagnosis or classification. Regarding terminology, different authors employ the labels problematic cannabis use (Rial et al., 2022), risky use (Seidel, Morgenstern & Hanewinkel, 2020), cannabis abuse (Legleye, Piontek, Kraus, Morand & Falissard, 2013) or cannabis dependence (Bastiani et al., 2013). In terms of instruments, there are many that allow the classification of the population based on whether or not they present CUD, and within the instruments themselves, there are different cut-off points for classification (Carr et al., 2022). In fact, a systematic review on the prevalence of CUD concluded that prevalences of CUD in consumers aged 18 years and older varied depending on the diagnostic instrument used. Thus, using AUDADIS (*Alcohol Use Disorder and Associated Disabilities Interview Schedule*), the prevalence of CUD was estimated at between 36.1% in 2001-2002 and 30.6% in 2012-2013, while with DSM-IV it was estimated at 15.0% in 2008 and 9.3% in 2017 (Leung, Chan, Hides, & Hall, 2020). This difference depending on the tool used was also observed in a study carried out in Ireland (Millar, Mongan, Smyth, Perry & Galvin, 2021b). Such considerable heterogeneity when classifying people with CUD makes it very difficult to compare the results obtained in different studies.

Both in Spain and in other countries, the study of cannabis use and its relationship with different sociodemographic and behavioural variables in the adult population has been limited since most studies have focused on the adolescent and young adult population. Most of the sociodemographic and behavioural variables linked to cannabis use in other studies, mainly in the United States, coincide with those in our study (Hasin et al., 2019; Jeffers, Glantz, Byers & Keyhani, 2021; Millar et al., 2021a). Thus, it has been observed that age is one of the sociodemographic variables that most influences cannabis use, with young adults being those with a greater likelihood of use (Hasin et al., 2019; Jeffers et al., 2021; Miller et al., 2021a). In the Spanish population, this has been associated with coping with negative feelings, followed by other reasons such as enhancing positive feelings, avoiding social rejection or increasing social cohesion (Casajuana Kögel et al., 2021). In addition, cannabis use at these ages may often be motivated by the need to feel part of a peer group, and the fact of having few or inadequate social, assertiveness or coping skills in these situations can favour the onset of use (Carr et al., 2022). A further reason that could explain this greater probability of use in the younger population may be the lower perception of risk at these ages (Pacek, Mauro & Martins, 2015). Designing measures to prevent the initiation of cannabis use in young people is therefore vital since it has been observed that early initiation of use increases the probability of developing dependence in adulthood (George, Hill & Vaccarino, 2018).

Being male has been another characteristic associated with a higher likelihood of cannabis use, both in our study and in previous studies (Jeffers et al., 2021; Millar et al., 2021a). Men engage in more risk behaviours than women (Byrnes, Miller & Schafer, 1999; Harris, Jenkins & Glaser, 2006) and the perception of risk associated with substance use is lower (Arias-de la Torre et al., 2021). In addition, as occurs with other substances such as alcohol, social and cultural factors can also play a role (Bosque-Prous et al., 2015; Pacek et al., 2015; Ronay & Kim, 2006). On the other hand, in this study it was estimated that being a man increases the probability of developing dependence on cannabis use by 2.5 times. This is in line with the results of previous studies which observed that men were more likely to end up developing cannabis dependence at some point in their lives compared to women (Feingold, Livne, Rehm & Lev-Ran, 2020). One explanation may be that men use cannabis products with a higher concentration of cannabinoid substances such as THC or CBD and use a greater number of routes of administration, behaviours that have been linked to the development of cannabis use dependence (Baggio et al., 2014; Daniulaityte et al., 2018).

The use of other substances such as tobacco or alcohol is associated with an increased risk of cannabis use and dependence (Weinberger et al., 2021). Indeed, in our study, being a smoker was the strongest determinant for being a cannabis user and the second strongest for being a dependent user. This relationship is mainly due to the fact that, in Spain, as in the rest of Europe, the most widespread pattern of cannabis use is together with tobacco in the form of joints (Casajuana et al., 2017; Schauer, Rosenberry & Peters, 2017; Schwitzer et al., 2016). For this reason, it is important that prevention programs are carried out at an early age and assess not only the use of cannabis, but also that of tobacco (Observatorio Español de las Drogas y las Adicciones, 2019).

Early onset of cannabis use has been found to increase the likelihood of developing CUD and cannabis dependence (Connor et al., 2021), and daily cannabis use increases the probability of dependent use. Previous studies have indicated that 17.0% of cannabis smokers and 19.0% of daily users met the criteria for being dependent users (Cougale, Hakes, Macatee, Zvolensky & Chavarria, 2016). Using cannabis daily is therefore established as one of the strongest predictors of the development of cannabis use dependence (Kroon et al., 2020).

The study presented here has limitations. First, cannabis use may be underestimated, since concealment of drug use due to social desirability bias (De Leeuw, 2008), among other things, has been documented. In the analysis of the problems associated with cannabis use, the CAST scale was used; although it is an instrument with proven screening capacity in adults, it has limitations such as the fact that the cut-off points are not universal (Legeye, Karila, Beck & Reynaud, 2007; Legleye et al., 2015). In addition, the results obtained in this study refer to an Autonomous Community of Spain (Galicia) and thus cannot be generalized to the entire Spanish population.

On the other hand, the study also has strengths, among them the large sample size that allows us to characterize cannabis use in detail at the level of an Autonomous Community with representative data by gender and age group. A further strength is that this study does not exclude advanced ages.

Although the overall prevalence of cannabis use is low in Galicia, 9% of young people between 16 and 24 years of age report that they used cannabis at the time of the survey, this being the age group with the highest prevalence of use. Measures to prevent cannabis use at an early age that promote healthy lifestyles are needed. In addition, such measures should offer leisure and healthy-use alternatives mainly to young men, who are those with higher prevalence.

Conflict of interests

The authors declare no conflict of interest.

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ORIGINAL

Emergency care carried out during the pandemic due to substance abuse in a Spanish province

Atenciones urgentes realizadas durante la pandemia por consumo de tóxicos en una provincia española

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Abstract

Introduction: During periods of isolation, people with substance use disorders may reduce tension, stress, uncertainty and possible distress by increasing the use of substances or practices that they have abused. The objective of this study was to evaluate the impact of the pandemic on emergency care and continuity of care for patients with substance use disorders. **Method:** Study carried out in the only psychiatric emergency service in the province at the Hospital Universitario Santa María de Lérida, which cares for 431,183 people. Sociodemographic, clinical and evolutionary variables were collected from all the patients treated during a period prior to lockdown (January 13, 2020, until March 14, 2020) and during the first (March 15, 2020 until June 20, 2020) and second states of emergency (from October 25, 2020 to May 9, 2021). **Results:** 908 patients attended with substance use disorder, representing 23.8% of all visits. During the first state of emergency, visits increased ($p < 0.001$) with a decrease in the average age ($p = 0.0023$). During the second state of emergency, there was an increase in the use of alcohol with respect to the rest of toxic substances ($p < 0.001$) and an increase in the visits of patients without prior follow-up ($p = 0.005$). **Conclusions:** Substance use disorder consultations increased in the first state of emergency, with patients being younger and attending for reasons related to outpatient discontinuity, while in the second state of emergency, alcohol use increased in people without prior follow-up and with small social networks. Admissions in the first state of emergency were shorter, with no subsequent link to other detoxification treatment centers and with an earlier return to the emergency room, especially in female users.

Keywords: pandemic, substance use disorder, alcoholism, emergencies, continuity of care

Resumen

Introducción: Durante los períodos de aislamiento, las personas con trastornos por uso de sustancias pueden reducir la tensión, el estrés, la incertidumbre y la posible angustia aumentando el uso de sustancias o prácticas de las que han abusado. El objetivo de este estudio es evaluar el impacto de la pandemia en las atenciones urgentes y continuidad asistencial de pacientes con trastorno por uso de sustancias. **Método:** Estudio realizado en el único servicio de urgencias de Psiquiatría de la provincia en el Hospital Universitario Santa María de Lérida, que atiende a 431.183 personas. Se recogen variables sociodemográficas, clínicas y evolutivas de todos los pacientes atendidos durante un periodo previo al confinamiento (13 de enero de 2020, hasta el 14 de marzo de 2020) y durante el primer (15 de marzo de 2020 hasta su 20 de junio de 2020) y segundo estado de alarma (desde el 25 de octubre de 2020 hasta el 9 de mayo de 2021). **Resultados:** 908 pacientes atendidos con Trastorno por Uso de Sustancias, representa el 23,8% de todas las visitas. Durante el primer estado de alarma, aumento de las visitas ($p < 0,001$) con una disminución de la edad media ($p = 0,023$). Durante el segundo estado de alarma, aumento del consumo de OH respecto al resto de tóxicos ($p < 0,001$) y un aumento de las visitas de pacientes sin seguimiento previo ($p = 0,005$). **Conclusiones:** Aumentaron las consultas por trastorno por uso de sustancias en el primer estado de alarma siendo más jóvenes y acudiendo por motivos de consulta relacionados con la discontinuidad ambulatoria mientras en el segundo estado de alarma repuntó el consumo de alcohol en personas sin seguimiento previo y con escasa red social. Los ingresos del primer estado de alarma fueron más breves, sin vinculación posterior a otros centros terapéuticos de desintoxicación y con un retorno más precoz a urgencias sobre todo en mujeres consumidoras.

Palabras clave: pandemia, trastorno por uso de sustancias, alcoholismo, urgencias, continuidad asistencial

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The COVID19 crisis created many additional challenges for substance use disorder patients. These included the closure of substance abuse treatment clinics, emergency departments focussing on COVID-19 patients, social distancing rules, and the supply of substances for drug users (Khatri & Perrone, 2020). In the face of these issues, some initiatives aimed at promoting telephone meetings without face-to-face evaluation made it possible to meet the needs of the most vulnerable during the current pandemic (Samuels et al., 2020).

Substance use disorder is highly comorbid with physical and mental illnesses, such as anxiety, depression, personality disorders, eating disorders, and abnormal mood changes (Kim, Qian & Aslam, 2020). During periods of isolation, people with disorders linked to psychoactive substances and other addictions may be tempted to reduce tension, stress, uncertainty, and possible distress by increasing their use of substances or practices that they have abused. This can mean relapses and setbacks for patients undergoing treatment (Fabelo-Roche, Iglesias-Moré & Gómez-García, 2021). On the other hand, drug use patients in complete remission are also in need of attention. A study in Israel analysing the impact of the pandemic on patients in complete remission found that stronger feelings of loneliness and less time free of drug use were associated with a greater desire to use drugs (Bonny-Noach & Gold, 2021). A recent Spanish study also warned that patients with a substance use disorder in remission may also have to cope with stress, thus presenting a greater risk of relapse (García-Álvarez, Fuente-Tomás, Sáiz, García-Portilla & Bobes, 2020).

The pandemic had a significant impact in Spain. For some months in 2020, this was the country with the second highest number of deaths from coronavirus worldwide (Henríquez, Gonzalo-Almorox, García-Goñi & Paolucci, 2020; RTVE 2022). Of the many moments of tension caused by the pandemic, it was perhaps the period coinciding with the first lockdown in Spain (March 14 to June 21, 2020) that caused the greatest shock to Spanish citizens, facing an unprecedented situation (Henríquez et al., 2020). During this period, a state of emergency was decreed, schools were closed, and citizens were ordered to stay in their homes unless they had justified reasons such as unavoidable work, buying food, or urgent treatment at health centres (Henríquez et al., 2020). The lockdown period also had important consequences at an economic level, with Spain the most affected country in Europe in this regard (Expansión, 2022).

The objective of this study was to assess the impact that the COVID 19 pandemic may have had on emergency care provided in a psychiatric ward to patients with substance use disorders, compared with those performed in a previous period.

Method

Sample and procedure

The study was carried out at the Santa María de Lleida University Hospital. This hospital is the only hospital providing emergency psychiatric care in the province of Lleida and has a catchment area of 431,183 people (INE, 2020). The hospital has 52 adult beds, 10 of which are specific for dual pathology, and a network of specific outpatient clinics for addictive behaviours. During the most critical period of COVID-19 transmission, the different units were converted to limit the spread of infection and the outpatient network carried out remote visits following health authority guidelines.

The data for this study were obtained by retrospective review of the digital medical records covering the sociodemographic data of patients, their diagnoses, reasons for consultation, and hospital admissions. The observation periods were: 1) before lockdown, from January 13, 2020, to March 14, 2020 and 2) during lockdown after the first state of emergency was decreed in Spain on March 15, 2020, until it was lifted on June 20, 2020, and during Spain's second state of emergency, from October 25, 2020, to May 9, 2021 (BOE, 2020) (Irigoyen-Otiñano et al., 2022).

Measurements

The following information was gathered from the digital clinical history: number of visits to the emergency department (ED) for psychiatric reasons in all the periods described, sociodemographic profile of patients seeking ED treatment (sex, date of birth, and marital status), psychiatric diagnosis following DSM-IV criteria (Tucker, 1991), reason for consultation and discharge referral.

Statistical analysis

Statistical analyses were performed with the IBM-SPSS v.23 statistical package. Continuous data were expressed as mean $\pm$ standard deviation, while categorical data were presented as percentages. The normal distribution was assessed using the Shapiro-Wilk test. One-way analysis of covariance (ANCOVA) was used to analyze differences between groups (pre-pandemic, first and second states of emergency), and pairwise comparisons were performed to identify which groups were different using estimated marginal means. When analyzing variables across two groups (pre-pandemic and state of emergency), chi-square and Student's *t* tests were used. As a non-parametric alternative, Fisher's exact and Mann-Whitney *U* tests were used as appropriate. Kaplan-Meier curves were used for longitudinal variables from hospital discharge (days until the first outpatient visit, days until the first contact with psychiatric emergencies, and days until readmission) to compare the time between pre-pandemic patients and the first state of emergency. Comparisons were made using the log-rank test. Hazard ratios (HR) and 95% confidence

intervals were calculated. Type I error was set at the usual value of 5% ($\alpha = 0.05$), with a two-sided approximation.

The authors affirm that all procedures contributing to this work complied with the ethical standards of the relevant national and institutional committees on human experimentation and with the Declaration of Helsinki of 1975, revised in 2008 (World Medical Association, 2020). This study was approved by the Ethics and Clinical Research Committee of the Arnau de Vilanova University Hospital.

Results

Emergency care performed

We recruited 908 patients with substance use disorder (SUD), representing 23.8% of all visits to the psychiatric emergency department (Table 1). During the first state of emergency, visits were seen to rise ($p < 0.001$), but with a decrease in the mean age of the patients ($p = 0.0023$). During the second state of emergency, an increase in the use of alcohol use was observed compared to other toxins ($p < 0.001$), as was an increase in the visits of patients without previous follow-up ($p = 0.005$). During this period, the number of visits by single patients also fell, while those by separated patients increased ($p < 0.001$ and $p = 0.010$ respectively). Regarding reasons for visiting, we

observed a decrease in psychotic symptoms in both states of emergency compared to the pre-pandemic period ($p = 0.019$) and an increase in visits for other reasons in the first state of emergency ($p = 0.020$). We did not find significant changes in home living arrangements, axis II diagnoses or post-discharge referrals between the periods. See Supplementary Table for pairwise comparisons.

When comparing the patients admitted for SUD during the pre-pandemic period and the first state of emergency (Table 2), we found a reduction of 6 ± 3 days in the duration of hospital stays during the first state of emergency ($p = 0.035$) and an increase of post-discharge home referrals together with a reduction in referrals to other non-hospital facilities ($p = 0.047$ and $p = 0.040$, respectively).

On analysing survival after hospital discharge (Table 2, Figure 1), the median time until an ED visit was found to be lower in patients admitted during the state of emergency than in the previous period (40.1 days vs. 160.7 days; HR for ED visit = 0.37; 95% CI = 0.15 to 0.87). Time to outpatient visit and time to readmission did not show significant differences. By gender, we found median survival until an ED visit to be lower in women than in men during the first state of emergency (38.9 days vs. 67.4 days; HR for the ED visit = 0.32; 95% CI = 0.14 to 0.95) but not during the pre-pandemic period (61.2 days vs. 162.0 days; HR for ED visit = 1.53; 95% CI = 0.33 to 6.95).

Figure 1

Kaplan-Meier curves analyzing the time (in days) from hospital discharge to the first emergency department visit: A) comparing the pre-pandemic period and the first state of emergency; B) comparing men and women in the pre-pandemic period; C) comparing men and women in the first state of emergency

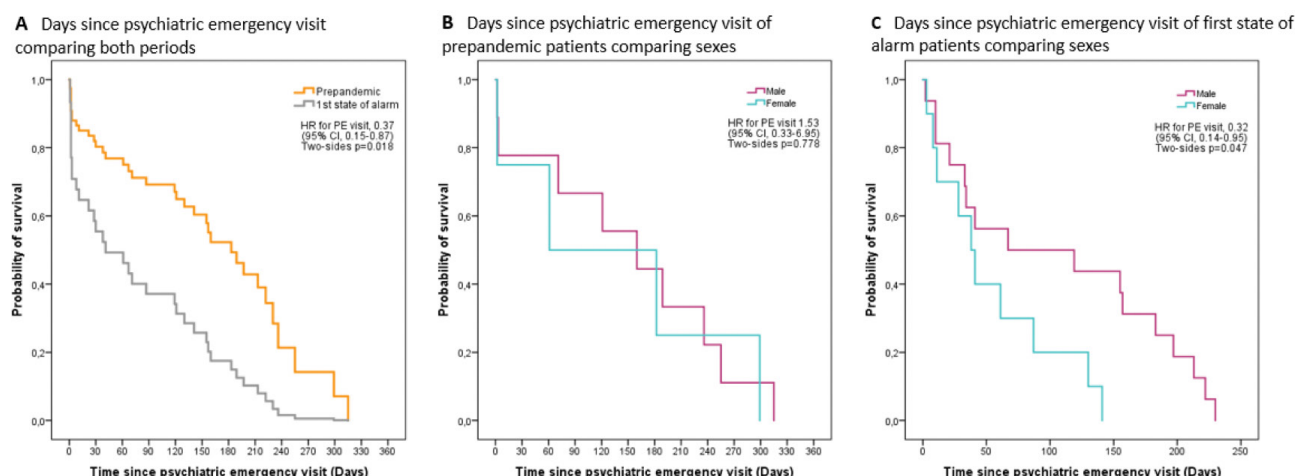


Table 1*Characteristics of visits to the HUSM psychiatry emergency department of patients with substance use disorders during the pandemic*

	Pre-pandemic (N = 173)	SE 1 (N = 264)	SE 2 (N = 471)	Statistical test; p
% of total during period	(N = 173)	SE 1	471/2212 (21.2)	$\chi^2=22.92$; <0.001*
Substances (%)	(N = 264)	SE 2		
- Alcohol	(N = 471)	Statistical test; p	94 (20)	$\chi^2=27.32$; <0.001*
- Others	156 (90.2)	246 (93.2)	377 (80)	
Women (%)	45 (26)	57 (21.5)	132 (28)	$\chi^2=3.66$; 0.160
Age (SD)	37.2 (11.6)	35.2 (12.06)	37.5 (12.0)	t=-2.45; 0.023*
Marital status (%)				
- Single	94 (56.2)	165 (63.2)	223 (50.1)	$\chi^2=15.73$; <0.001*
- Partner	45 (26.9)	63 (24.1)	111 (25.3)	$\chi^2=0.42$; 0.808
- Separated	27 (16.1)	31 (11.8)	96 (21.9)	$\chi^2=9.24$; 0.010*
- Widowed	1 (0.6)	2 (0.7)	8 (1.8)	F=1.45; 0.374
Home living arrangement				
- Living alone	59 (35.9)	106 (40.6)	161 (36.5)	$\chi^2=2.92$; 0.232
- Living with family	95 (57.9)	139 (53.2)	242 (55)	$\chi^2=0.64$; 0.726
- Institution	10 (6.1)	16 (6.1)	37 (8.4)	$\chi^2=1.28$; 0.525
Reason for visit (%)				
- Psychotic symptoms	12 (6.9)	9 (3.4)	11 (2.3)	$\chi^2=7.89$; 0.019*
- Unipolar symptoms	4 (2.3)	0 (0)	8 (1.6)	$\chi^2=5.35$; 0.069
- Bipolar symptoms	0 (0)	0 (0)	2 (0.4)	$\chi^2=1.86$; 0.395
- Substance use	67 (38.7)	82 (31.1)	184 (39.0)	$\chi^2=5.05$; 0.080
- Suicidal ideation	6 (3.5)	8 (3)	22 (4.6)	$\chi^2=1.33$; 0.513
- Attempted suicide	12 (6.9)	16 (6.1)	34 (7.2)	$\chi^2=0.36$; 0.835
- Any suicidal behaviour	18 (10.4)	24 (9.1)	56 (11.8)	$\chi^2=1.41$; 0.494
- Behavioural disorder	16 (9.2)	33 (12.5)	39 (8.2)	$\chi^2=3.49$; 0.175
- Anxiety symptoms	19 (10.9)	26 (9.8)	49 (10.4)	$\chi^2=0.14$; 0.929
- Sleep problems	16 (9.2)	26 (9.8)	31 (6.5)	$\chi^2=2.86$; 0.239
- Administrative	13 (7.5)	31 (11.7)	49 (10.4)	$\chi^2=2.06$; 0.357
- Other	8 (4.6)	33 (12.5)	42 (8.9)	$\chi^2=7.86$; 0.020*
Axis II diagnoses (%)				
- Without diagnosis	121 (69.9)	162 (61.3)	288 (61.1)	$\chi^2=4.56$; 0.102
- Cluster B	52 (30.1)	102 (38.6)	180 (38.2)	$\chi^2=4.171$; 0.124
- Cluster C	0 (0)	0 (0)	3 (0.6)	F=2.793; 0.248
Without prior follow-up (%)	44 (25.4)	64 (24.2)	163 (34.6)	$\chi^2=10.66$; 0.005*
Discharge referrals (%)				
- Psychiatry admission	33 (19.6)	53 (20.7)	87 (18.5)	$\chi^2=2.08$; 0.601
- Home referral	140 (80.4)	211 (79.6)	384 (81.5)	

Note. *Includes suicidal ideation and attempted suicide.

Abbreviations: SD = standard deviation; SE = state of emergency; TC = treatment centre; χ^2 = chi-square; t = Student's t; * = p < 0.001.

Table 2
Characteristics of hospital admissions for substance use disorder and post-discharge survival analysis

	Pre-pandemic (N = 33)	State of emergency 1 (N = 53)	Statistical test; p
% of total during period	33/163 (20.2)	53/235 (22.5)	$\chi^2=0.29$; 0.582
Substances (%)			
- Alcohol	4 (12.1)	3 (5.7)	F=1.12; 0.287
- Others	29 (87.9)	50 (94.3)	
Women (%)	10 (30.3)	15 (28.3)	$\chi^2=0.04$; 0.842
Age (SD)	38.7 (15.4)	36.1 (12.9)	t=0.861; 0.392
Marital status (%)			
- Single	19 (57.6)	24 (45.3)	$\chi^2=1.75$; 0.193
- Partner	11 (33.3)	21 (39.6)	$\chi^2=1.01$; 0.884
- Separated	2 (9.1)	7 (13.2)	F=3.28; 0.426
- Widowed	0 (0)	1 (1.9)	-
Home living arrangement			
- Living alone	15 (45.5)	17 (32.1)	$\chi^2=0.31$; 0.618
- Living with family	17 (51.5)	33 (62.3)	$\chi^2=0.15$; 0.729
- Institution	1 (3)	3 (5.7)	F=1.31; 0.239
Without prior follow-up (%)	22 (66.7)	42 (79.2)	$\chi^2=1.74$; 0.194
Axis II diagnoses (%)			
- Without diagnosis	21 (63.6)	38 (71.7)	$\chi^2=0.59$; 0.612
- Cluster B	12 (26.4)	15 (28.3)	$\chi^2=0.51$; 0.468
- Cluster C	0 (0)	0 (0)	-
Type of admission			
- Voluntary	13 (46.4)	19 (44.2)	$\chi^2=0.03$; 0.853
- Involuntary	15 (53.6)	24 (55.8)	
Nº of previous admissions	3.4 (4.8)	3.7 (7.2)	t=-0.20; 0.837
Length of stay (days)	17 (13)	11 (10)	t=2.14; 0.035*
Discharge referral (%)			
- Home	16 (57.1)	36 (83.7)	$\chi^2=5.46$; 0.047*
- Subacute care	8 (28.6)	6 (14)	$\chi^2=1.89$; 0.114
- TC	0	0	-
- Other	4 (14.2)	1 (2.3)	$\chi^2=5.42$; 0.040*
Nº of post-discharge visits to ED mean (SD)	2.3 (8.1)	7.1 (22.4)	U=459.5; 0.678
Post-discharge OUTPATIENT visit			
- Face-to-face	18 (54.4)	23 (43.3)	$\chi^2=1.48$; 0.216
- Telephone	8 (24.2)	10 (18.9)	
Survival analysis			
Mean survival until (95% CI)			
- outpatient visit, days	25.3 (2.7 to 47.8)	12.3 (6.8 to 17.1)	LR=2.58; 0.087
- first visit to ED, days	160.7 (32.6 to 287.3)	41.1 (2.1 to 87.2)	LR=4.24; 0.018*
- readmission, days	239.9 (115.3 to 356.6)	175.2 (118.5 to 231.4)	LR=2.50; 0.161

Note. Abbreviations: SD = standard deviation; TC = treatment centre; χ^2 = chi-square; t = Student's t; U = Mann-Whitney U test; LR = log-rank test; * = p < 0.001.

Supplementary table*Pairwise comparison of the significant variables from the ANCOVA in Table 1*

	Pre-pandemic (N = 173)	SE 1 (N = 264)	SE 2 (N = 471)	Statistical test; p
% of total during period	173/697 (24.8)	264/902 (29.2)	471/2212 (21.2)	$\chi^2=22.92$; <0.001* PP vs EA1; 0.038* PP vs EA2; 0.056 EA1 vs EA2; <0.001*
Alcohol (%)	17 (9.8)	18 (6.8)	94 (20)	$\chi^2=27.32$; <0.001* PP vs EA1; 0.626 PP vs EA2; 0.021* EA1 vs EA2; 0.002*
Age (SD)	37.2 (11.6)	35.2 (12.06)	37.5 (12.0)	$t=-2.45$; 0.023* PP vs EA1; <0.001* PP vs EA2; 0.046 EA1 vs EA2; 0.011*
Single (%)	94 (56.2)	165 (63.2)	223 (50.1)	$\chi^2=15.73$; <0.001* PP vs EA1; 0.302 PP vs EA2; 0.048* EA1 vs EA2; 0.003*
Separated (%)	27 (16.1)	31 (11.8)	96 (21.9)	$\chi^2=9.24$; 0.010* PP vs EA1; 0.051 PP vs EA2; 0.566 EA1 vs EA2; 0.027*
Psychotic symptoms (%)	12 (6.9)	9 (3.4)	11 (2.3)	$\chi^2=7.89$; 0.019* PP vs EA1; 0.041* PP vs EA2; 0.015* EA1 vs EA2; 0.302
Other reasons for visit (%)	8 (4.6)	33 (12.5)	42 (8.9)	$\chi^2=7.86$; 0.020* PP vs EA1; 0.012* PP vs EA2; 0.035* EA1 vs EA2; 0.048*
Without prior follow-up (%)	44 (25.4)	64 (24.2)	163 (34.6)	$\chi^2=10.66$; 0.005* PP vs EA1; 0.524 PP vs EA2; <0.001* EA1 vs EA2; 0.002*

Note. Abbreviations. SD = standard deviation; SE = state of emergency; * = $p < 0.001$.

Discussion

During the first state of emergency, we observed a significant increase in patients attending the psychiatric emergency department for substance use disorders compared to the pre-pandemic period and to the second state of emergency. Several studies carried out during lockdown also reported rising admissions among substance users (Czeisler et al., 2020; Rehm et al., 2020). The visits for reasons largely related to the problems caused by the interruption of the continuity of care due to the restrictions imposed by the health authorities also stood out (Moreno et al., 2020).

In this first state of emergency analyzed in our study, it is worth noting that patients had a lower mean age. This has also been reported in other studies (Faris et al., 2021), and it appears that lockdown affected younger adults in particular, probably because their psychosocial well-being depends on frequent social interactions to a greater extent than in the case of older adults (Carstensen, 1992).

Conversely, in the second state of emergency, we identified an increase in visits due to specific problems with the use of alcohol compared to other toxins. Several studies have reported an increase in alcohol use in society during

lockdown (Vanderbruggen et al., 2020). Visits from patients not previously linked to the mental health network also increased during this period. Several hypotheses allow us to interpret this increase in alcohol use in the longer lockdown period since the contexts of alcohol use and the reasons for drinking may have changed during the pandemic (Patrick et al., 2022). A study examining change in drinking motives among the general population reported COVID-related increases due to depression and coping motives, as well as decreases in social, enhancement, and conformity motives (Graupensperger et al., 2021). Despite this, we did not find significant results in terms of diagnosis. Regarding sociodemographic aspects, we did observe an increase in separated patients and a decrease in singles in the second state of emergency. It has been reported in the literature that social support can reduce internalized stigma and improve mental health among people with substance use disorder problems (Birtel, Wood & Kempa, 2017). This is consistent with other findings showing that spouses, as well as other family members and friends, can be protective factors for substance users (Gariépy, Honkaniemi & Quesnel-Vallée, 2016).

Despite the fact that substance use disorder can be closely related to psychosis (Moggi, 2018), the number of patients with substance use disorders who presented psychotic symptoms decreased during both lockdown periods.

Regarding patients admitted for substance use disorder, their average stay during the first state of emergency decreased significantly, and home referral on discharge predominated over referrals to treatment centres to consolidate cessation. This is in contrast with results of other international studies showing the need to maintain treatment processes when dealing with a population which is vulnerable due to substance use, social precariousness, and medical comorbidity (Chacon et al., 2021). Consistent with the COVID-related difficulties in maintaining optimal continuity of care, we identified a post-discharge return to the psychiatric ED in a shorter time than in periods prior to the pandemic, this being more predominant in women users than in men users. This aspect has already been reported in a Spanish study in which 21,207 subjects participated, revealing that sex-related factors were associated with alcohol use as a coping strategy during the pandemic [women, OR = 0.600, $p < 0.001$] (Martínez-Cao et al., 2021).

Limitations and strengths

Some limitations should be taken into account when interpreting the results of this study. First, the data presented here come from the digital clinical history, and we have based ourselves on the clinical diagnoses of different psychiatrists. However, given its single-centre study nature, the common clinical criterion among all the psychiatrists working in our emergency department

supports the internal validity of the results. Second, rather than validated measures of symptom severity, we used 'hospital admission' as a logical measure of disease severity. While this measure increases the clinical transferability of our results, they may have been affected by hospital logistics during the pandemic. Third, this sample is representative of a population benefiting from secondary care services, and the results may not be generalizable to patients requiring primary care services. Fourth, the observed two-month period prior to the pandemic may be short despite being representative of the pre-pandemic situation. Fifth, it was not possible to detail the type of substance use in full. Finally, this is a cross-sectional study based on a single-centre ED and no causal inferences can be made. As a strength of the study, we were able to obtain a representative sample of all substance use related psychiatric emergencies treated in the province, extracting relevant data of clinical and care interest to allow other models of care to be designed in future health crisis situations.

Conclusion

Consultations for substance use disorder increased during the first state of emergency, with patients being younger and seeking help because of outpatient discontinuity, while the second state of emergency saw a renewed rise in alcohol use among people without prior treatment and with reduced social networks. Admissions during the first state of emergency were shorter, without subsequent referral to other detoxification treatment centres and with an earlier return to the ED, especially in female users.

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Conflict of interests

The authors declare no conflicts of interest.

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ORIGINAL

Training mental health residents in tobacco and alcohol: Relationship with their clinical intervention

Formación en tabaco y alcohol de residentes de salud mental: Relación con su intervención clínica

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Abstract

The objective of this study is to describe how mental health professionals in training (residents) apply the brief intervention (5As) on the tobacco and alcohol consumption to their patients, and if this is related to the training received and/or their own consumption. This is a cross-sectional study in which a self-reported questionnaire was administered to first-year residents of mental health professionals in Catalonia (2016-2019) (psychiatrists, psychologists and nurses). We performed a descriptive analysis of the variables and we applied a chi-square test for the comparison of proportions. 154 professionals completed the questionnaire. Half of them had not received any university training on intervention in smoking (46.8%) or in alcohol consumption (53.2%). Those who had received it, advised, assessed and helped their patients to quit smoking more frequently ($p = 0.008$, $p = 0.037$ and $p = 0.039$, respectively). Those who had received training in alcohol intervention gave advice, performed assessments and offered help to quit/reduce alcohol among their patients more frequently ($p < 0.001$, $p = 0.001$, and $p < 0.001$, respectively). Residents usually helped more to quit or reduce alcohol than to quit tobacco ($p < 0.001$). 60.1% of them never or rarely helped their patients

Resumen

El objetivo del estudio es analizar la intervención breve 5As en tabaco y alcohol de los profesionales sanitarios residentes de salud mental y analizar su relación con la formación recibida y/o con su propio consumo. Se trata de un estudio transversal en el que se administró un cuestionario autoinformado a residentes de primer año de salud mental de Cataluña de 2016 a 2019 (médicos, psicólogos y enfermeras). Se realizó un análisis descriptivo de las variables y comparación de proporciones a través de pruebas chi-cuadrado. Contestaron 154 profesionales, la mitad no había recibido ninguna formación universitaria sobre intervención en tabaquismo (46,8%), ni en consumo de alcohol (53,2%). Los que sí la habían recibido, aconsejaban, evaluaban y ayudaban a dejar de fumar a sus pacientes con mayor frecuencia ($p = 0,008$, $p = 0,037$ y $p = 0,039$; respectivamente). Los que habían recibido formación en alcohol, aplicaban más consejo, evaluación y deshabituación sobre el alcohol a sus pacientes ($p < 0,001$; $p = 0,001$; y $p < 0,001$; respectivamente). En global, ayudaban más a dejar o reducir el alcohol que el tabaco ($p < 0,001$). Un 60,1% de todos ellos nunca o raramente ayudaba a sus pacientes a dejar de fumar y un 34,6% en el caso

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to stop smoking and 34.6% rarely helped in the case of alcohol. In general, nurses did more intervention for tobacco than alcohol use, regardless of the training received. The lack of training of professionals in tobacco and alcohol intervention at university is related to a lack of intervention on patients in their professional practice, regardless of their own consumption.

Keywords: teaching, internship and residency, tobacco, alcohol drinking, mental health

Two of the most important causes of morbidity and mortality in developed countries are tobacco and alcohol consumption (WHO, 2009; WHO, 2018). Patients with psychiatric pathologies have a much higher prevalence of smoking than the general population (Guydish et al., 2011; Lasser et al., 2000). There is evidence regarding the relationship between smoking and reduced life expectancy in psychiatric patients (Colton & Manderscheid, 2006) and the exacerbation of their psychiatric pathology (Jones, Thornicroft, Coffey & Dunn, 1995; Montoya, Herbeck, Svikis & Pincus, 2005). It is also observed that patients with mental illnesses are more vulnerable to risky alcohol use (Arias et al., 2016), with the consequence of worsening progression of their psychiatric pathology (Vanable, Carey, Carey & Maisto, 2003) and significant deterioration of their physical health (Gual, Bravo, Lligona & Colom, 2009). One of the main obstacles that smokers must overcome in quitting is the lack of motivation to do so. For this reason, the advice of a health professional plays an important role in smoking abstinence and in reducing risky drinking. The brief intervention proposed by the WHO, based on the 5As (Ask: ask about use; Advise: advise to quit/cut down; Assess: assess readiness to change; Assist: help with change; Arrange: agree on follow-up) and implemented by health professionals, has shown efficacy in changing smoking and drinking behaviour (Fiore et al., 2008; Kaner et al., 2009) and should be a priority with this group of patients. The social acceptance historically enjoyed by alcohol and tobacco in our culture hinders the perception of risk in the general population, an inadequate perception often shared by some health professionals. If we add the shortage of training in the university system regarding addictions (Richmond, Zwar, Taylor, Hunnisett & Hyslop, 2009), all this could explain a lack of involvement of health professionals in addressing these issues (Carson et al., 2012). The use of tobacco and alcohol by health professionals themselves could also have a significant impact, both in maintaining the social acceptance of these behaviours, given the role model potential these professions have at a social level, and in terms of the interventions in their professional practice. Numerous studies have shown that health professionals who smoke are less involved and do implement fewer interventions with their patients than non-smokers, including minimal counselling, and

del alcohol. Las enfermeras intervenían más en tabaquismo que en alcohol, hubieran recibido o no formación universitaria. El estudio concluye que la poca formación universitaria recibida por los profesionales se asocia con una frecuencia baja de intervención sobre sus pacientes, sin que exista relación entre el nivel de intervención y su propio consumo.

Palabras clave: enseñanza, internado y residencia, tabaco, consumo de bebidas alcohólicas, salud mental

that when they do, they obtain worse results (Juárez-Jiménez, Pérez-Milena, Valverde-Bolívar & Rosa-Garrido, 2015a). On the other hand, there appear to be no studies specifically linking the university education received to the level of tobacco and alcohol intervention. Few studies suggest that such intervention occurs more frequently when the professional feels more trained in these fields (Herrero, Segura, Martínez, García & Torre, 2018; Zafra-Ramírez, Pérez-Milena, Valverde-Bolívar, Rodríguez-Bayón & Delgado-Rodríguez, 2019).

The objective of this study was therefore to describe the intervention of professionals with specialized health training (residents) in mental health on tobacco and alcohol use, and to analyze whether their intervention is related to the training they received at university, to their professional role, and/or to their own use of tobacco and alcohol.

Methods

A cross-sectional observational study was carried out using a self-reported questionnaire administered in May 2016, 2017, 2018 and 2019. The target population was all first-year resident health professionals in the field of mental health in Catalonia (graduates in Medicine specializing in Psychiatry, in Psychology majoring in clinical psychology, and graduates in Nursing majoring in mental health). In Spain, the specialty in mental health is exclusively carried out by doctors, psychologists and nurses. The target population thus consisted of 363 first-year residents (from 2016 to 2019) in psychiatry, clinical psychology, and specialist mental health nursing.

The anonymous questionnaire was distributed just before the start of a joint training session (three hours) of compulsory attendance for all first-year residents in the three specialties on dealing with smoking and alcohol. The questionnaire was drawn up ad hoc by a multidisciplinary group of experts and comprised 27 items including: sociodemographic data (3 items); training received on smoking and alcohol during their university degree (3 items); intervention usually carried out with their patients on smoking (6 items) and alcohol (6 items), based on the 5As intervention recommended by the WHO. For each of the 5A intervention actions, five response options were offered depending on whether they performed that action “Always”, “Frequently”, “Sometimes”, “Rarely” or “Never”. Questions about the professional’s own smoking

and drinking habits were also included in the questionnaire, with the level of dependence on tobacco assessed using the Heaviness of Smoking Index (HSI) (Heatherton, Kozlowski, Frecker, Rickert & Robinson, 1989) and the AUDIT test for alcohol dependence (Pérula de Torres et al., 2005). Alcohol consumption was described in Standard Drink Units (SDUs), with 1 SDU equivalent to 10 g of alcohol.

The descriptive analysis of the main variables included the frequency and percentage of qualitative variables and the mean and standard deviation of quantitative variables. To compare proportions, the chi square test was used, with statistical significance set at $p < 0.05$. The five response options for each of the 5As intervention actions were grouped into three categories: “Always/Frequently”, “Sometimes” and “Never/Rarely”.

The work was carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki of 1975).

All analyses were carried out with the SPSS 20.0 statistical package (SPSS Inc, Chicago IL, USA).

Results

Of the 363 first-year residents in mental health (from 2016, 2017, 2018 and 2019), 169 participated in the smoking and alcohol training sessions. Completed questionnaires were obtained from 154 (50 doctors, 38 psychologists and 66 nurses), with a response rate of 91.1%. The year-by-year distribution was 44 in 2016, 48 in 2017, 29 in 2018 and 33 in 2019, with no differences in the distribution by profession (data not shown).

As shown in Table 1, mean age was 26.5 years (SD: 3.8); 78.8% were women, 16.3% were smokers (18.4% psychologists, 18.4% doctors and 13.6% nurses). According to the HSI, 90% had low dependency and 10% medium dependency. The mean number of attempts to quit smoking among all smokers was 1.3 (SD: 1.1) and 25.7% had never made any attempt. Regarding alcohol, 79.1% (85.7% physicians, 78.9% psychologists and 74.2% nurses) reported drinking, although moderately, with an average of 3 SDUs on non-working days and 0.4 on working days. No significant differences between men and women were found in levels of smoking or drinking (data not shown).

Regarding training received as part of their university studies, 46.8% did not receive any training in smoking cessation intervention, with nurses receiving the most training (59.1% had training). As for training in alcohol intervention, 53.2% reported not having received any training, with nurses having the least (36.4%) and psychologists the most (55.3%) training. As for other drugs, only 37.0% received training (Table 1).

Regarding intervention in their workplace, we observed that, overall, there was much more intervention in alcohol than in smoking at all levels of intervention (Table 2).

Similarly, a comparative analysis was carried out between the different levels of intervention and the training received. The results showed that in both smoking and alcohol, there was no relationship between the training received and the frequency with which they asked questions and recorded consumption. However, levels of advising, assessing the readiness to quit and helping to quit showed clearly significant differences depending on the training received, both in smoking and alcohol. That is, in residents who did not receive training during their university studies there was a lower frequency of intervention: whether advising ($p = 0.008$ and $p < 0.001$ for smoking and alcohol, respectively), assessing the patients readiness to change ($p = 0.037$ and $p = 0.001$), as well as helping them to change with precise guidelines ($p = 0.039$ and $p < 0.001$) and follow-up ($p = 0.071$ and $p < 0.001$) (Table 4).

In the analysis of intervention on smoking by professional group, we observed that those who asked less frequently were the psychologists, with 63.2% of them always or almost always asking about smoking, compared to 87.7% of the other professionals. As for advice, only 8.1% of psychologists gave it always or almost always, while nurses did so 34.8% and doctors 13.3% of the time. Never or rarely helping their patients to quit smoking was reported by 73.5% of physicians and 71.1% of psychologists, while 22.4% and 26.3%, respectively, did so sometimes. Only 4.1% of physicians and 2.6% of psychologists reported providing this help always or almost always, while 25.8% of nurses reported doing so. As for agreeing on a follow-up, 33.3% of the psychologists always or almost always did so, with 47.0% of nurses and 22.9% of doctors doing so (Table 3).

Regarding intervention on drinking, 86.8% of psychologists always or almost always asked, compared to 87.9% of nurses and 96.0% of doctors; 51.4% of psychologists, 48% of doctors, 31.8% of nurses always or almost always advised. In terms of assessing the motivation to quit or reduce drinking, 62.2% of the psychologists always or almost always did this, compared to 52.0% of the doctors and 42.4% of the nurses. Always or almost always helping to change alcohol use was reported by 46.0% of doctors, compared to 37.8% of psychologists and 24.2% of nurses. Agreement on follow-up was made by 58.0% of doctors, 55.6% of psychologists and 40.9% of nurses (Table 3).

The analysis of intervention levels by gender yielded no significant differences between male and female professionals in the frequency of intervention, both in smoking and alcohol intervention, with the exception of the variable *asking the patient if he or she drinks*, which is always or frequently done more by women than men (92.4% vs 81.3%; $p = 0.028$).

On analysing the relationship between professional group, training and intervention, it was noted that with regard to smoking, the most relevant variable is profession,

Table 1
Sociodemographic and behavioural characteristics of the participants

Variable	All % (n)	Psychiatrists % (n)	Psychologists % (n)	Nurses % (n)
All	100% (154)	32.5 (50)	24.6 (38)	42.9 (66)
Gender				
Male	21.2 (32)	28.0 (14)	18.9 (7)	16.9 (11)
Female	78.8 (119)	70.0 (35)	63.1 (30)	83.1 (54)
Age (mean, SD)	26.5 (3.8)	27.1 (3.3)	26.8 (2.2)	26.0 (4.4)
Smoking				
Never	70.6 (108)	69.4 (34)	71.1 (27)	71.2 (47)
Ex-smoker	13.1 (20)	12.2 (6)	10.5 (4)	15.2 (10)
Smoker	16.3 (25)	18.4 (9)	18.4 (7)	13.6 (9)
Drinking				
Yes	79.1 (121)	85.7 (42)	78.9 (30)	74.2 (49)
No	20.9 (32)	14.3 (7)	21.1 (8)	25.8 (17)
SDUs on work days (mean, SD)	0.4 (0.6)	0.6 (0.8)	0.3 (0.5)	0.2 (0.5)
SDUs on non-work days (mean, SD)	3.0 (2.4)	3.0 (1.8)	2.9 (1.9)	2.9 (3.1)
Training in smoking at university				
Yes	53.2 (82)	56.0 (28)	39.5 (15)	59.1 (39)
No	46.8 (72)	44.0 (22)	60.5 (23)	40.9 (27)
Training in alcohol use at university				
Yes	46.8 (72)	46.0 (23)	55.3 (21)	36.4 (24)
No	53.2 (82)	54.0 (27)	44.7 (17)	63.6 (42)
Training in other drugs at university				
Yes	37.0 (57)	40.0 (20)	44.7 (17)	30.3 (20)
No	63.0 (97)	60.0 (30)	55.3 (21)	69.7 (46)

Note. n = 154.

1 SDU = 10 g of alcohol.

Table 2
Use of the 5As intervention on smoking and alcohol use among participants

Variable	Smoking % (n)	Alcohol % (n)	p*
Ask			<0.001
Always / Frequently	87.7 (135)	90.3 (139)	
Sometimes	7.1 (11)	7.8 (12)	
Never / Rarely	5.2 (8)	1.9 (3)	
Advise			<0.001
Always / Frequently	22.7 (33)	41.8 (64)	
Sometimes	31.6 (48)	36.6 (56)	
Never / Rarely	46.7 (71)	21.6 (33)	
Assess readiness to change			<0.001
Always / Frequently	27.9 (43)	50.3 (77)	
Sometimes	33.8 (52)	31.4 (48)	
Never / Rarely	38.3 (59)	18.3 (28)	
Assist			<0.001
Always / Frequently	13.1 (20)	32.7 (50)	
Sometimes	26.8 (41)	32.7 (50)	
Never / Rarely	60.1 (92)	34.6 (53)	
Arrange follow-up			<0.001
Always / Frequently	36.0 (54)	50.0 (76)	
Sometimes	22.7 (34)	27.0 (41)	
Never / Rarely	41.3 (62)	23.0 (35)	
Record use			0.009
Always / Frequently	76.0 (117)	83.1 (128)	
Sometimes	12.3 (19)	9.7 (15)	
Never / Rarely	11.7 (18)	7.1 (11)	

Note. n = 154.

Some figures do not add up to the total due to some missing values.

*Chi-square test.

Table 3
Use of the 5As intervention on smoking and alcohol by profession

Variable	All % (n)	Psychiatrists % (n)	Psychologists % (n)	Nurses % (n)
All	100% (154)	32.5 (50)	24.6 (38)	42.9 (66)
SMOKING				
Ask				
Always / Frequently	87.7 (135)	98.0 (49)	63.2 (24)	93.9 (62)
Sometimes	7.1 (11)	0	23.7 (9)	3.0 (2)
Never / Rarely	5.2 (8)	2.0 (1)	13.2 (5)	3.0 (2)
Advise				
Always / Frequently	21.7 (33)	13.3 (7)	8.1 (3)	34.8 (23)
Sometimes	31.6 (48)	26.5 (13)	18.9 (7)	42.4 (28)
Never / Rarely	46.7 (71)	59.2 (29)	73.0 (27)	22.7 (15)
Assess readiness to change				
Always / Frequently	27.9 (46)	18.0 (9)	7.9 (3)	47.0 (31)
Sometimes	33.8 (52)	34.0 (17)	31.6 (12)	34.8 (23)
Never / Rarely	38.3 (59)	48.0 (24)	60.5 (23)	18.2 (12)
Assist				
Always / Frequently	13.1 (20)	4.1 (2)	2.6 (1)	25.8 (17)
Sometimes	26.8 (41)	22.4 (11)	26.3 (10)	30.3 (20)
Never / Rarely	60.1 (92)	73.5 (36)	71.1 (27)	43.9 (29)
Arrange follow-up				
Always / Frequently	36.0 (54)	22.9 (11)	33.3 (12)	47.0 (31)
Sometimes	22.7 (34)	16.7 (8)	11.1 (4)	33.3 (22)
Never / Rarely	41.3 (62)	60.4 (29)	55.6 (20)	19.7 (13)
Record use				
Always / Frequently	76.0 (117)	84.0 (42)	50.0 (19)	84.8 (56)
Sometimes	12.3 (19)	10.0 (5)	15.8 (6)	12.1 (8)
Never / Rarely	11.7 (18)	6.0 (3)	34.2 (13)	3.0 (2)
ALCOHOL				
Ask				
Always / Frequently	90.3 (139)	96.0 (48)	86.8 (33)	87.9 (58)
Sometimes	7.8 (12)	4.0 (2)	10.5 (4)	9.1 (6)
Never / Rarely	1.9 (3)	0	2.6 (1)	3.0 (2)
Advise				
Always / Frequently	41.8 (64)	48.0 (24)	51.4 (19)	31.8 (21)
Sometimes	36.6 (56)	40.0 (20)	18.9 (7)	43.9 (29)
Never / Rarely	21.6 (33)	12.0 (6)	29.7 (11)	24.2 (16)
Assess readiness to change				
Always / Frequently	50.3 (77)	52.0 (26)	62.2 (23)	42.4 (28)
Sometimes	31.4 (48)	32.0 (16)	18.9 (7)	37.9 (25)
Never / Rarely	18.9 (28)	16.0 (8)	18.9 (7)	19.7 (13)
Assist				
Always / Frequently	34.6 (53)	46.0 (23)	37.8 (14)	24.2 (16)
Sometimes	32.7 (50)	28.0 (14)	18.9 (7)	43.9 (29)
Never / Rarely	32.7 (50)	26.0 (13)	43.2 (16)	31.8 (21)
Arrange follow-up				
Always / Frequently	50.0 (76)	58.0 (29)	55.6 (20)	40.9 (27)
Sometimes	27.0 (41)	22.0 (11)	11.1 (4)	39.4 (26)
Never / Rarely	23.0 (35)	20.0 (10)	33.3 (12)	19.7 (13)
Record use				
Always / Frequently	83.1 (128)	94.0 (47)	65.8 (25)	84.8 (56)
Sometimes	9.7 (15)	4.0 (2)	15.8 (6)	10.6 (7)
Never / Rarely	7.1 (11)	2.0 (1)	18.4 (7)	4.5 (3)

Note. n = 154.

Table 4
Use of the 5As intervention on smoking and alcohol by university training

Variable	All n=154 % (n)	University training Smoking n=82; Alcohol n=72 YES % (n)	University training Smoking n=72; Alcohol n=82 NO % (n)	p*
SMOKING				
Ask				0.858
Always / Frequently	87.7 (135)	86.6 (71)	88.9 (64)	
Sometimes	7.1 (11)	7.3 (6)	6.9 (5)	
Never / Rarely	5.2 (8)	6.1 (5)	4.2 (3)	
Advise				0.008
Always / Frequently	21.7 (33)	31.7 (26)	12.5 (9)	
Sometimes	31.6 (48)	32.9 (27)	29.2 (21)	
Never / Rarely	46.7 (71)	35.4 (29)	58.3 (42)	
Assess readiness to change				0.037
Always / Frequently	27.9 (46)	36.6 (30)	18.1 (13)	
Sometimes	33.8 (52)	30.5 (25)	37.5 (27)	
Never / Rarely	38.3 (59)	32.9 (27)	44.4 (32)	
Assist				0.039
Always / Frequently	13.1 (20)	16.0 (13)	9.7 (7)	
Sometimes	26.8 (41)	33.3 (27)	19.4 (14)	
Never / Rarely	60.1 (92)	50.6 (41)	70.8 (51)	
Arrange follow-up				0.071
Always / Frequently	36.0 (54)	43.0 (34)	28.2 (20)	
Sometimes	22.7 (34)	24.1 (19)	21.1 (15)	
Never / Rarely	41.3 (62)	32.9 (26)	50.7 (36)	
Record use				0.398
Always / Frequently	76.0 (117)	72.0 (59)	80.6 (58)	
Sometimes	12.3 (19)	13.4 (11)	11.1 (8)	
Never / Rarely	11.7 (18)	14.6 (12)	8.3 (6)	
ALCOHOL				
Ask				0.237
Always / Frequently	90.3 (139)	93.1 (67)	87.8 (72)	
Sometimes	7.8 (12)	6.9 (5)	8.5 (7)	
Never / Rarely	1.9 (3)	0	3.7 (3)	
Advise				<0.001
Always / Frequently	41.8 (64)	58.3 (42)	27.2 (22)	
Sometimes	36.6 (56)	26.4 (19)	45.7 (37)	
Never / Rarely	21.6 (33)	15.3 (1)	27.2 (22)	
Assess readiness to change				0.001
Always / Frequently	50.3 (77)	66.7 (48)	35.8 (29)	
Sometimes	31.4 (48)	19.4 (14)	42.0 (34)	
Never / Rarely	18.9 (28)	13.9 (10)	22.2 (18)	
Assist				<0.001
Always / Frequently	34.6 (53)	51.4 (37)	19.8 (16)	
Sometimes	32.7 (50)	26.4 (19)	38.3 (31)	
Never / Rarely	32.7 (50)	22.2 (16)	42.0 (34)	
Arrange follow-up				<0.001
Always / Frequently	50.0 (76)	72.2 (52)	30.0 (24)	
Sometimes	27.0 (41)	12.5 (9)	40.0 (32)	
Never / Rarely	23.0 (35)	15.3 (11)	30.0 (24)	
Record use				0.241
Always / Frequently	83.1 (128)	86.1 (62)	80.5 (66)	
Sometimes	9.7 (15)	5.6 (4)	13.4 (11)	
Never / Rarely	7.1 (11)	8.3 (6)	.1 (5)	

Note. Some figures do not add up to the total due to some missing values.

*Chi-square test.

with a significance level of $p = 0.007$, while for alcohol the most relevant variable is having received training ($p < 0.001$).

In terms of the relationship between the variable *use by the professional* and level of intervention, the analysis yielded no significant relationships in either smoking or alcohol.

Discussion

Results of this study show that the level of systematic intervention by professionals on tobacco and alcohol use in patients undergoing treatment for mental health disorders was low, with intervention on alcohol being slightly higher overall than on smoking.

For a precise interpretation of the results, it is important to take into account the limitations of this study. One of the main limitations lies in the self-reported nature of the bias data, which could be the results if residents declared higher levels of intervention in their patients and lower levels of their own smoking and especially alcohol. The sample of residents may be also be biased, since 54.5% did not attend the training and therefore did not participate in the study. These residents may not have attended the training because they had already been trained in the course of their university degree, so the lack of training and perhaps the lack of practice would be overestimated in the residents studied. However, the percentage of attendance for this training is similar to that of sessions on other subjects within this same training session cycle. Finally, this study has linked the level of training received by the professionals to their level of clinical intervention, and although being trained is the main and basic condition for intervention, other variables may be influencing the level of intervention, for example, following the model of senior professionals or following the priorities set by the centre where they work, among other reasons not included in this study. However, the results were obtained from professionals working in different health centres in Catalonia with different situations and characteristics, so the effect of this aspect would be limited.

The strengths of this study include the high questionnaire response rate from the residents who attended the training and the fact that it is one of the few studies in Spain analysing the relationship between training, intervention and the smoking and drinking habits of mental health residents.

Despite the existing scientific evidence on the importance of tobacco and alcohol use in psychiatric patients (Callaghan et al., 2014; Callaghan, Gatley, Sykes & Taylor, 2018; Petrakis, Gonzalez, Rosenheck & Krystal, 2002), we have observed that less than 15% of professionals provided any help to quit smoking systematically. For alcohol, the level of intervention was somewhat higher (32%). This frequency, however, is very similar to that found in other

studies, which also show a high interest in receiving training (Prochaska, Fromont & Hall, 2005). Regarding gender, in general, no differences between men and women were found in the frequency of intervention. However, the results must be interpreted with caution since only 21% of the sample were men, and perhaps in a larger total sample some significant trends may be observed.

The training received is related to the type of interventions performed by the professional. In our study, the relationship seems to be negative, that is, having received training was not necessarily related to more intervention, while not having received it was linked to less intervention, as has been shown in other studies (Carson et al., 2012; Prochaska et al., 2008).

About half of the first-year mental health residents in Catalonia did not receive any training in smoking and alcohol intervention during their university degree (Medicine, Psychology and Nursing), which seems to translate into a lack of intervention on their patients. If we take into account the important effects that smoking and drinking have on the health of people with mental disorders, both from the point of view of prevalence and morbidity and mortality, as well as the severity of the psychiatric pathology, it is incomprehensible how little training is received. This shortcoming is probably due to a gap between study plans and scientific evidence.

The percentage of resident smokers was smaller than that of the general adult population (22.6% in Catalonia) (ESCA 2021, Generalitat de Catalunya, 2022), a similar result to that found in another study (Juárez-Jiménez, Valverde-Bolívar, Pérez-Milena & Moreno-Corredor, 2015b) with a sample of residents. The fact that psychologists and doctors in our sample are those who smoked the most is striking, although the prevalence is still lower than in the general population. In the case of alcohol, most residents drank (79.1%), as was observed in another study (Bolívar, Milena & Corredor, 2013), although quantity and frequency were both very low.

It should be noted that among nurses the prevalence of smokers was lower (13.6%) than among other professionals (18.4% in psychologists and doctors).

Psychologists are those who carried out less frequently intervention in practically all 5As phases and, although the training factor could play a part, they were not the ones receiving the least training, since 50% stated that they had done so. Smoking status did not appear to have an influence either, as some studies have suggested (Cerrada, Olmeda, Senande, Rodríguez & Cuesta, 2005; Juárez-Jiménez et al., 2015a). This low level of intervention by psychologists is also paradoxical, since smoking and alcohol interventions are in essence based on psychological techniques (counselling, motivational interviewing or behavioural strategies and cognitive restructuring in relapse prevention).

The training received by nursing professionals is striking: while 59.1% stated that they received training in smoking, only 36.4% said that they received training in dealing with alcohol use. These data led to a high level of intervention in smoking compared to a lower level of intervention in alcohol problems, despite the intervention skills and techniques, except in the case of severe alcohol use, being similar and the need for intervention for the promotion of health being the same.

Smoking intervention in the field of mental health in Spain is still deficient, both in clinical intervention and in the training of professionals, among other aspects (Ballbè et al., 2012). People with serious mental disorders die an average of 25 years earlier than the general population mostly from diseases caused or exacerbated by smoking (Bolívar et al., 2013; Colton & Manderscheid, 2006; Miller, Paschall & Svendsen, 2006). Similarly, there is clear evidence that the progression of psychiatric pathology is worse in patients with mental illnesses who smoke and drink (American Psychiatric Association, 2006). However, it does not seem that all this has led to any changes, neither in the field of training nor in clinical practice. The results of this study show the need to introduce modifications in the education of mental health professionals since training is associated with increased intervention as well as a different response in attitudes towards this intervention (Payne et al., 2014; Prochaska et al., 2008).

It is important, therefore, to incorporate training interventions in tobacco and alcohol, as well as other drugs, in the university curricula of the health professions in order to promote greater awareness and to increase levels of clinical intervention, which would in turn increase the quality and life expectancy of a highly vulnerable population.

Conclusions

University training on intervention in smoking and alcohol use received by professionals in the field of mental health was directly associated with the frequency of intervention on their patients in their normal clinical practice, with the professionals receiving more training on their degree courses being those who intervened the most. There were differences in professional role, with nurses the ones who carried out interventions with greater frequency in smoking, and doctors in alcohol use. The alcohol and smoking status of professionals did not show a relationship with levels of intervention. Given that only half of the professionals had received training in this field and due to the importance of this type of intervention for public health, it would be advisable to review the university curricula of health professions.

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Conflict of interests

The authors declare no conflicts of interest with this work.

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ORIGINAL

From non-problematic smartphone use to smartphone addiction: Impulsivity-based profiles

Del uso no problemático a la adicción al móvil: Perfiles de impulsividad

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Abstract

Problematic smartphone use (PSU) is an uncontrollable behavior that impedes the ability to stop using it despite potential negative consequences. This excessive behavior has been considered in the research field as a behavioral addiction, as literature has shown common characteristics with behavioral addictions, including its impulsivity-driven factor. However, impulsivity is a multidimensional construct whose specific traits lead differently to each addiction. Hence, the present study aimed to address the different existent PSU profiles depending on their individual impulsivity personality traits. To this end, $N = 412$ adults (average age 31.91, $SD = 11.70$, including 108 men and 304 women) were recruited to explore their daily smartphone usage, level of smartphone addiction (SAS-SV) and impulsivity profile across the five impulsivity personality traits (UPPS-P). Cluster analysis revealed the existence of three different profiles: one without PSU; one showing an excessive impulsively but almost no addictive smartphone use, expressing only a loss of control symptomatology; and one showing excessive impulsively but also addictive smartphone patterns, driven mainly by the impulsivity personality traits of negative urgency, positive urgency and lack of premeditation. Therefore, this study showed the impulsivity personality traits that differentiate excessive from addictive smartphone use, which is valuable information for the development of more precise prevention and interventions programs.

Key words: problematic smartphone use, excessive smartphone use, smartphone addiction, impulsivity, cluster analysis

Resumen

El uso problemático del móvil (PSU, por sus siglas en inglés) es un comportamiento incontrolable que dificulta la capacidad para detenerlo, pese a las potenciales consecuencias negativas. Este comportamiento excesivo ha sido considerado en el campo de la investigación como una adicción conductual, ya que la literatura ha demostrado características comunes con otras adicciones conductuales además de que está mediado por la impulsividad. Sin embargo, la impulsividad es un constructo multidimensional cuyas dimensiones específicas se relacionan de modo diferencial con los distintos tipos de adicción. Por consiguiente, el presente estudio pretende explorar los perfiles de uso del móvil dependiendo de las dimensiones de impulsividad. Para ello, se registró el uso diario del móvil, el nivel de adicción al móvil (SAS-SV) y el patrón de impulsividad a través de los cinco rasgos de personalidad impulsiva (UPPS-P) de 412 adultos (con una media de edad de 31,91 años, $DT = 11,70$, incluyendo 108 hombres y 304 mujeres). El análisis de clúster mostró la existencia de tres tipos de perfiles: uno sin PSU; uno con impulsividad excesiva, pero sin uso adictivo del móvil, presentando solo sintomatología de pérdida de control; y otro con impulsividad excesiva y patrones adictivos al móvil, caracterizados principalmente por los rasgos impulsivos de urgencia negativa, urgencia positiva y falta de premeditación. Por tanto, este estudio muestra las dimensiones de personalidad impulsiva que diferencian un uso excesivo del adictivo al móvil. Esta información es útil para el desarrollo de programas de prevención e intervención mejor adaptados a estos perfiles de comportamiento.

Palabras clave: uso problemático del móvil, uso excesivo del móvil, adicción al móvil, impulsividad, análisis clúster

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Problematic smartphone use (PSU) is broadly defined as an excessive behaviour that hinders the ability to stop using the device besides the possible negative consequences it could lead to (Busch & McCarthy, 2021). PSU is a novel construct that has been gaining attention in the research field as its prevalence is augmenting being nowadays an emerging public health issue (Billieux, Maurage, Lopez-Fernandez, Kuss & Griffiths, 2015). A recent meta-analysis showed that PSU is increasing across the world, showing China and Saudi Arabia the highest rates while Germany and France the lowest (Olson et al., 2022b). Moreover, the social restrictions caused by the COVID-19 pandemic have boosted PSU, mediated by factors such as isolation, anxiety and fear of missing out (Elhai et al., 2021; Elhai, Yang, Rozgonjuk & Montag, 2020; Li, Zhan, Zhou & Gao, 2021; Ratan, Zaman, Islam & Hosseinzadeh, 2021). Besides social media access, PSU can be also motivated by other engaging activities such as online gaming, shopping, gambling or pornography. In this sense, the smartphone device is acting as a facilitator of the gratifications received from these activities (Niedermoser et al., 2021; Panova & Carbonell, 2018; Yang & Gong, 2021). Currently, the number of active mobile devices is larger than the total world population, and the new variety of functions that these devices offer (e.g., working, information seeking, social networking, health, and leisure-related activities) have increased the dependency (Konok, Pogány & Miklósi, 2017). Excessive smartphone use (ESU) has been linked to lower academic performance (Amez & Baert, 2020), lower work productivity (Duke & Montag, 2017), a poorer quality of life (Kliesener, Meigen, Kiess & Poulain, 2022), social interaction anxiety (Kuru & Çelenk, 2021), materialism (Lee, Son & Kim, 2016), higher perceived stress (Samaha & Hawi, 2016), sleep disturbances, anxiety and depression (Demirci, Akgönül & Akpınar, 2015; Elhai, Yang, McKay & Asmundson, 2020). In this sense, there is a raising interest in developing interventions oriented to reduce PSU and its consequences (Olson, Sandra, Chmoulevitch, Raz & Veissière, 2022a).

PSU is also referred to as smartphone addiction (SA) (Busch & McCarthy, 2021) for its similarity with other behavioural addictions such as pathological gambling, internet, gaming, shopping, sex and exercise addiction; as all of them share an uncontrolled psychological dependency manifested with craving (Wilcockson, Osborne & Ellis, 2019), withdrawal symptoms (Eide, Aarestad, Andreassen, Bilder & Pallesen, 2018) and anxiety (Cheever, Rosen, Carrier & Chavez, 2014) when its use results restricted. However, within the clinical field it is still not recognized as an addiction, as can be seen in the behavioural addiction section of the DSM-5, that includes so far only pathological gambling (American Psychiatric Association [APA], 2013) and of the ICD-11, that recognizes only gambling and

gaming disorders (World Health Organization, 2019). Within the research field, the concept of SA has been mainly accepted and increasingly gaining importance, with studies focusing on the variety of its antecedents and the severity of its consequences (e.g., Alhassan et al., 2018; Anshari, Alas & Sulaiman, 2019; Beison & Rademacher, 2016; Dhamayanti, Dwiwina & Adawiyah, 2019; Geng, Gu, Wang & Zhang, 2021). In this sense, advances have been made in the assessment of SA, such as with the development of a reliable and valid SA diagnose tool: the smartphone addiction scale (SAS) that measures addiction to smartphones providing a cut-off value for distinguishing smartphone addicted from non-addictive individuals (Kwon et al., 2013b), allowing the opportunity to develop studies describing SA vulnerability factors.

Similar to other addiction processes, PSU has shown to be based on impulsivity mechanisms (Contractor, Weiss, Tull & Elhai, 2017). Impulsivity is not a categorical, but rather a continuous construct: to one extent it is defined as the ability to take quick decisions and actions without much hesitation, which can be actually advantageous depending on the context. But on the other extreme, when impulsivity results exacerbated in an individual, it can lead to risky and maladaptive actions followed by negative consequences, which is represented in pathologies including addictions (Dalley & Robbins, 2017; Moreno et al., 2012). Moreover, considerable research indicates that impulsivity is a multifaceted construct, separable in different personality traits that are also each uniquely related to addictions (Mitchell & Potenza, 2014). One of the most established subdivisions is defined by the five impulsivity traits self-reported measure: UPPS-P, that distinguishes negative and positive urgency, lack of premeditation, lack of perseverance and sensation seeking (Whiteside & Lynam, 2001). Known the relevance of impulsivity in addictive processes, previous studies have been consistently finding relationships of high impulsivity personality traits with ESU or SA (Grant, Lust & Chamberlain, 2019; Jo, Euihyeon & Kim, 2017; Kim et al., 2016; van Endert & Mohr, 2020).

Hence, PSU is a construct that is growing in literature and rising interest for its increasing incidence, however, the limits between ESU with an actual SA are not clear yet. Moreover, although the relationship between impulsivity and PSU has been established and replicated, the involvement of each impulsivity personality trait in the different levels of PSU has not been described to date. Thus, the present study aims to draw the different PSU profiles and to describe to what extent each specific impulsivity personality trait is present in each group. To focus on individual differences within PSU is necessary for a better understanding of this problematic behaviour and consequently, for the development of more precise and individualised evaluation, prevention, and intervention programs.

Method

Participants

The present study involved a total sample of $n = 412$ full aged Spanish participants (age range: 18-89 years old; average age 31.91, $SD = 11.70$, including 108 men and 304 women). The educational level of the participants was: primary school (0.24%), secondary school (5.34%), pre-university (20.63%), medium professional degree (2.91%), high professional degree (12.86%), university degree (34.47%), master's degree (21.60%) and PhD. degree (1.94%).

Procedure

The sample was composed by volunteers who completed an online survey distributed via snowball sampling procedure, initially using social media and e-mail. Inclusion criterion was full aged individuals who were informed about the study and voluntarily consented to participate in the study.

Materials

Daily smartphone usage and Smartphone Addiction Scale-Short Version (SAS-SV)

Daily smartphone usage was registered through the online survey requesting the mean smartphone daily usage hours. The SAS-SV is a validated scale that measures smartphone addiction (original from Kwon et al., 2013a, Spanish version from López-Fernández, 2017). It is the most cited and used measure of ESU to date (Olson et al., 2022b). It is composed of 10 items in Likert scale format, where 1 is "strongly disagree" and 6 "strongly agree", where the highest score means the highest presence of smartphone addiction. The cut-off point to distinguish addictive smartphone users is located at 32, according to López-Fernández (2017), not distinguishing between genders, as no differences were found between genders in the Spanish population in the SAS-SV. The SAS-SV provides scores for each smartphone addiction symptom: loss of control (LC), cognitive disturbance (CD), ignoring negative consequences (IC), withdrawal (WD) and tolerance (TOL). The scale showed content and concurrent validity and internal consistency with Cronbach alpha .88 (López-Fernández, 2017). In this research, non-parametric bootstrapped internal consistency coefficients and corresponding 95% confidence intervals were considered acceptable ($\omega = .86$, 95% CI [.81, .87], $\alpha = .86$, 95% CI [.83, .88]).

Short UPPS-P Impulsivity scale

The UPPS-P scale (original from Whiteside & Lynam, 2001, short Spanish version from Cándido, Orduña, Perales, Verdejo-García & Billieux [2012]), was designed to measure impulsivity differentiating the five involved impulsive personality traits: negative urgency (NU) that refers to the tendency to act rashly in response to negative affective states, positive urgency (PU) implies impulsive responses to positive affective states, lack of premeditation

(LPREME), which is the propensity to make quick decisions without considering the consequences, lack of perseverance (LPERSE) and sensation seeking (SS), and it consists of 20 items. Among other problematic behaviours, this scale has been traditionally used to study the impulsive component of addictive behaviours such as pathological gambling (Savvidou et al., 2017), compulsive buying (Claes & Müller 2017), food addiction (Murphy, Stojek & MacKillop, 2014) and problematic practice of physical exercise (Kotbagi, Morvan, Romo & Kern, 2017). The Cronbach alpha extracted from this scale ranged from .61 to .81, suggesting acceptable internal consistency for the five subscales (Cándido et al., 2012). In this research, non-parametric bootstrapped internal consistency coefficients and corresponding 95% confidence intervals for the whole scale were considered acceptable ($\omega = .85$, 95% CI [.81, .87], $\alpha = .86$, 95% CI [.83, .87]). The non-parametric bootstrapped estimations of internal consistencies for each subscale were also considered appropriate for negative urgency ($\omega = .79$, 95% CI [.75, .83], $\alpha = .79$, 95% CI [.76, .82]), lack of premeditation ($\omega = .81$, 95% CI [.77, .85], $\alpha = .81$, 95% CI [.76, .85]), lack of perseverance ($\omega = .83$, 95% CI [.79, .86], $\alpha = .81$, 95% CI [.77, .87]) and sensation seeking ($\omega = .84$, 95% CI [.81, .87], $\alpha = .84$, 95% CI [.81, .86]). The lower estimates were observed for positive urgency subscale ($\omega = .68$, 95% CI [.63, .73], $\alpha = .67$, 95% CI [.61, .72]) but it was even higher than the minimum reported by Cándido et al. 2012.

Statistical analysis

Clusters were generated including the total score for smartphone addiction (SAS-SV - total score) and the five impulsivity personality traits to characterize each group: negative urgency, positive urgency, lack of premeditation, lack of perseverance and sensation seeking. The variables were standardized before performing the clustering analysis. The optimal number of clusters was determined with R (Version 4.0.2) using the NbClust package (Version 3.0) (Charrad, Ghazzali, Boiteau & Niknafs, 2014). The similarity measure selected for the NbClust was Euclidean distances. The k -means procedure was executed with the Hartigan-Wong algorithm (Hartigan & Wong, 1979) limiting the number of interactions to 25 and using 25 random seeds. As data was non-normally distributed according to the Kolmogorov-Smirnov normality test, clusters were compared in each variable using with Kruskal-Wallis test and Mann-Whitney U post-hoc test with IBM SPSS (Version 24). All contrasts were bilateral, significance was set up at $p \leq .05$ and effect sizes were interpreted according to Cohen's classification (Cohen, 1988, 1992): small ($\eta^2 \geq .01$), medium ($\eta^2 \geq .06$), and large ($\eta^2 \geq .14$); and small ($r \geq .01$), medium ($r \geq .06$), and large ($r \geq .14$). The dataset of the current study is available under the following source: https://osf.io/374jp/?view_only=89d2c2d94f564b25b51beb3626188f7f.

Ethics

Participants were informed about the study and all provided informed consent. The present work was approved by the Bioethics Commission in Human Research of the University of Almeria and all data was protected under the Spanish Organic Law 3/2018 of 5 December, on the Protection of Personal Data and Guarantee of Digital Rights. The study procedures were carried out in accordance with the ethical principles for medical research involving human subjects from the 64th World Medical Association (WMA) General Assembly, Fortaleza, Brazil, October 2013 (World Medical Association, 2013), updated from the original Declaration of Helsinki.

Results

The best fit for the cluster analysis identified three groups of participants. Each cluster was labelled for its PSU properties from now on defined as: cluster 1: non-problematic smartphone use (NPSU) ($n = 147$), cluster 2: excessive smartphone use (ESU) ($n = 158$) and cluster 3: smartphone addiction (SA) ($n = 107$). Table 1 shows the demographic characteristics of each group:

Results showed a main effect of cluster on daily smartphone usage ($H(2) = 16.32, p < .001, \eta^2 = .02$) (Figure 1). Post-hoc analysis indicated that the SA group showed significantly more daily smartphone usage compared to the

NPSU group ($U = 5606.00, p < .001, r = .02$), and the ESU group showed significantly more daily smartphone usage compared to the NPSU group ($U = 9781.50, p = .016, r = .14$).

Figure 2 shows the number of individuals displaying smartphone addiction, according to Kwon et al. (2013a) (scoring above 32 in the total score of the SAS-SV scale). There was a main effect of cluster in the percentage of participants classified as smartphone addicts ($H(2) = 141.52, p < .001, \eta^2 = .31$). Post-hoc analysis revealed that in the SA group, there were more participants with smartphone addiction compared to the ESU ($U = 3646.50, p < .001, r = .59$) and the NPSU group ($U = 3341.50, p = .001, r = .58$). No significant differences were found between the ESU and the NPSU group ($U = 11537.50, p = .88, r = .01$).

The comparison of the groups in the five different symptoms of smartphone addiction measured through the SAS-SV (Figure 3) revealed a main effect of the clustering group for all dimensions: LC ($H(2) = 102.66, p = .001, \eta^2 = .29$), CD ($H(2) = 81.52, p < .001, \eta^2 = .22$), IC ($H(2) = 43.94, p < .001, \eta^2 = .13$), WD ($H(2) = 69.94, p < .001, \eta^2 = .19$) and TOL ($H(2) = 61.19, p < .001, \eta^2 = .17$). Post-hoc analysis indicated that the SA group scored higher in all dimensions of smartphone addiction compared to the ESU and the NPSU groups ($p < .001$ for both cases in all variables). The ESU group scored significantly above the NPSU group in loss of control ($U = 8742.00, p < .001, r = .13$).

Table 1

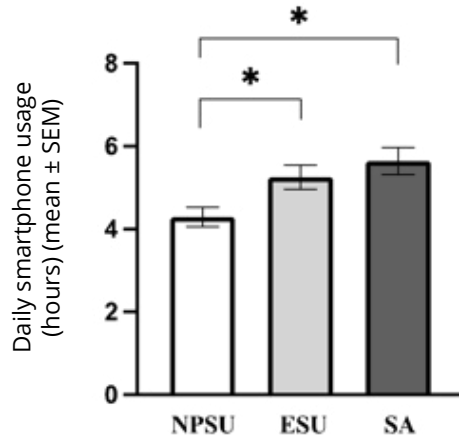
Shows the number of participants (n) located in each of the three clusters and demographic characteristics of each group

Cluster		1: NPSU	2: ESU	3: SA
<i>n</i>		147	158	107
% of woman		70.7%	73.4%	78.5%
Age (Mean [<i>SD</i>])		34.73 (12.13)	31.07 (11.17)	30.47 (10.16)
Educational level (% of participants located in each level)	Primary school	0.0%	0.6%	0.0%
	Secondary school	4.1%	4.4%	8.4%
	Pre-university	17.7%	19.0%	27.1%
	Medium professional degree	2.0%	3.2%	3.7%
	High professional degree	15.6%	11.4%	11.2%
	University degree	27.9%	45.6%	27.1%
	Master's degree	29.9%	14.6%	20.60%
PhD. degree		2.7%	1.3%	1.9%

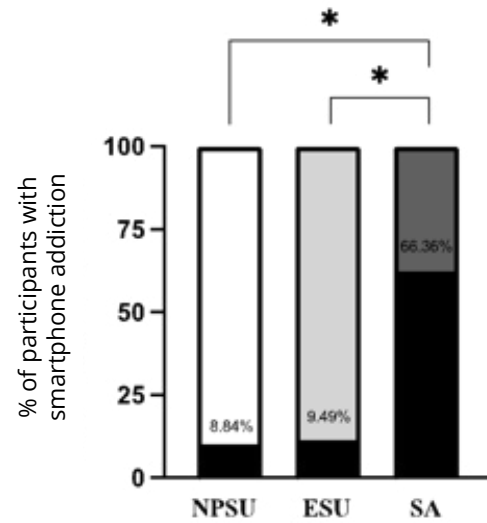
Note: NPSU: non-problematic smartphone use, ESU: excessive smartphone use and SA: smartphone addiction.

Figure 1

Mean score $\pm$ standard error of the mean (SEM) obtained by each of the three groups (NPSU, ESU and SA) in the daily smartphone usage (hours per day). NPSU: non-problematic smartphone use, ESU: excessive smartphone use and SA: smartphone addiction. * $p \leq .05$


Figure 2

Percentage of participants scoring as smartphone addicted users according to the total score in the SAS-SV scale. NPSU: non-problematic smartphone use, ESU: excessive smartphone use and SA: smartphone addiction. * $p \leq .05$



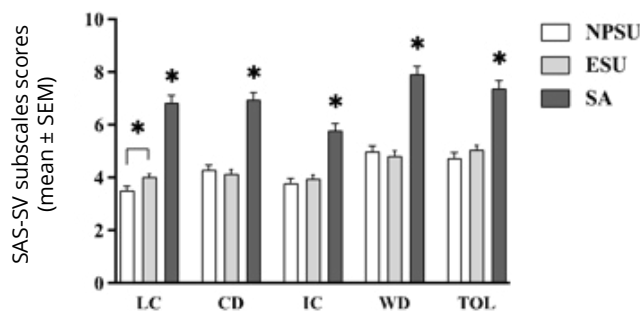
Finally, the comparison of the three groups in the five different impulsivity personality traits measured through the UPPS-P scale (Figure 4) displayed a main effect of the clustering group for all traits: NU ($H(2) = 188.00, p = .001, \eta^2 = .42$), PU ($H(2) = 146.62, p < .001, \eta^2 = .36$), LPERM ($H(2) = 159.99, p < .001, \eta^2 = 0.41$), LPERSE ($H(2) = 88.40, p < .001, \eta^2 = 0.21$) and SS ($H(2) = 88.40, p < .001, \eta^2 = .21$). Post-hoc analysis showed that the SA group scored significantly higher than the ESU and the NPSU group in all traits ($p < .001$ for both cases in all variables). SA participants scored significantly above ESU participants

in negative urgency ($U = 6771.00, p = 0.005, \eta^2 = .67$), positive urgency ($U = 4583.00, p < .001, \eta^2 = .42$) and lack of premeditation ($U = 2428.50, p < .001, \eta^2 = .59$).

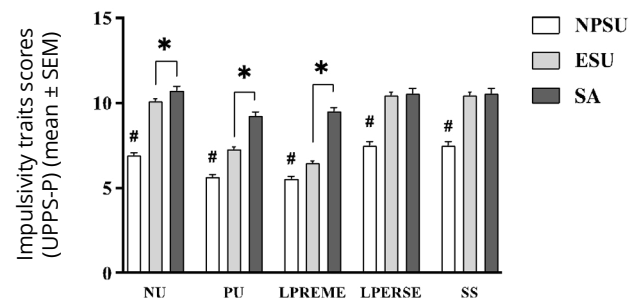
We found no statistically significant differences between men and women in daily smartphone usage ($t(410) = 1.20, p = .23, d = 0.12, r = .06$), SAS-SV scores ($t(410) = 1.00, p = .32, d = 0.10, r = .05$) or UPPS-P scores ($t(410) = 0.85, p = .40, d = 0.08, r = .04$). Negative statistically significant correlations were found between age and daily smartphone usage ($r = -.14, p = .004$), the SAS-SV ($r = -.14, p = .004$) and the UPPS-P scores ($r = -.180, p < .001$).

Figure 3

Mean score $\pm$ standard error of the mean (SEM) obtained by each of the three groups in the SAS-SV subscales. LC: loss of control, CD: cognitive disturbance, IC: ignoring negative consequences, WD: withdrawal, TOL: tolerance, NPSU: non-problematic smartphone use, ESU: excessive smartphone use and SA: smartphone addiction. * $p \leq .05$


Figure 4

Mean score $\pm$ standard error of the mean (SEM) obtained by each of the three groups in the five impulsivity personality traits measured through the UPPS-P. NU: negative urgency, PU: positive urgency, LPERME: lack of premeditation, LPERSE: lack of perseverance and SS: sensation seeking, NPSU: non-problematic smartphone use, ESU: excessive smartphone use and SA: smartphone addiction. * $p \leq .05$



Discussion

In the present research we found three different clustering profiles based on the level of smartphone addiction and the impulsivity personality traits. One group showing low PSU and low impulsivity personality traits scores (NPSU group). One group presenting an impulsive profile with an excessive but almost no addictive smartphone use (ESU group), showing only elevated loss of control addictive symptomatology. And finally, one group displaying an impulsive profile, with an excessive and addictive smartphone use (SA group). Compared to the NPSU group, the ESU and the SA groups showed higher levels of impulsivity in all dimensions: NU, PU, LPREME, LPERE and SS. However, compared to the ESU group, the SA group showed even higher levels of impulsivity in NU, PU and LPREME, which are the three impulsivity personality dimensions that characterize this addictive profile. This study shows the impulsivity personality traits that differentiate excessive from addictive smartphone use, pointing towards their importance for the design of intervention programs, that should address their reduction. We also found that age was negatively correlated with the principal measures (smartphone daily usage, smartphone addiction and impulsivity scores). Other studies have found a special vulnerability of young people to PSU and have expressed the need for taking this population into special consideration in the development of this problematic behavior (Pastor, García-Jiménez & López-de-Ayala, 2022; Sohn, Rees, Wildridge, Kalk & Carter, 2019; Wacks & Weinstein, 2021).

Comparing the three groups, the NPSU group showed the lowest daily smartphone usage. In addition, this group displayed the lowest impulsivity scores in all traits. Compared to the SA group, the NPSU group showed lower addiction symptomatology in all measures, and compared to the NPSU group, only lower scores in loss of control. 8.84% of the participants in this group scored as addicted to smartphones, which might describe a little but existent population that makes a smaller use of their smartphones besides showing high levels of addiction. This can be due to specific life circumstances that impede a larger smartphone use, but also and presumably due to the lower impulsivity levels, that describe a self-controlled profile which besides these addictive symptoms, is able to overcome the excessive behaviour. This group represents how low impulsivity might play a protective role in the development of PSU as documented in previous studies (Cudo, Torój, Demczuk & Francuz, 2020; Kim et al., 2016).

The ESU group is characterized by an excessive daily smartphone usage compared to the NPSU group, however, these individuals are not showing great signs of addiction, as almost all smartphone addiction measures are like the NPSU group. Only the loss of control addictive symptomatology showed to be increased in this group. This

addictive property is closely related to this excessive use, as it represents a high tendency to check the smartphone for not missing out conversations, and to neglect work or other previously planned tasks for spending more time than expected on the smartphone (López-Fernández, 2017). 9.94% of the individuals in this group showed SA, but this rate is still similar to the NPSU group. As a result, this group refers to a subpopulation that makes a high use of their smartphone but does not show an addictive pattern. This result might enlighten the open controversy about the limits between ESU and SA, showing that an excessive smartphone use is not always related to addiction, which contributes to the avoidance of over-pathologizing (Panova & Carbonell, 2018) and highlights that PSU studies need to put the attention not only in the “how much”, but also in the “why” (Busch & McCarthy, 2021). Although the reasons for spending much time on the smartphone are diverse, the data replicates that an impulsive personality profile is closely related to an excessive smartphone use (Kim et al., 2016; van Endert & Mohr, 2020). Moreover, this impulsivity driven ESU has been related to risky behaviours such as using the smartphone while walking (Igaki, Romanowich & Yamagishi, 2019) and while driving (Hayashi, Rivera, Modico, Foreman & Wirth, 2017). Hence, although this group is not addiction-based, considering the overuse, the loss of control symptomatology and the impulsive personality profile, individuals with ESU could be taken into consideration as a risky population and as a vulnerable group to potentially develop SA.

Participants from the SA group showed similar daily smartphone usage as the ESU group, that is in both cases higher than in the NPSU group. However, compared to the previous two groups (NPSU and ESU), the SA group is clearly distinguished for containing the highest number of participants with addiction to smartphone and for showing also higher scores in the five symptoms of smartphone addiction. The impulsivity personality traits that characterize this group and distinguishes it from the ESU group are negative urgency, positive urgency, and lack of premeditation. Negative and positive urgency are closely related constructs and the majority of studies find positive correlations between them (Billieux et al., 2021). Negative urgency is the impulsivity personality trait that has been more often associated with risky behaviours and addictions. In fact, it is considered a transdiagnostic endophenotype of addictive disorders (Um, Whitt, Revilla, Hunton & Cyders, 2019), drug abuse, problematic gambling, risky sexual behaviors and binge eating (Cyders, Coskunpinar & VanderVeen, 2016; Fischer, Wonderlich, Breithaypt, Byrne & Engel, 2018). In the same line, negative urgency has been linked to smartphone addiction, as a decisive mediator in the relation between post-traumatic stress disorder, depression, anxiety and stress with PSU (Contractor et al., 2017; Lee & Lee, 2019). As the development of addictions tend to respond to the necessity of

escaping from negative emotions, the smartphone use could be fulfilling the function of avoiding the confrontation with the negative emotions present in the reality (Li et al., 2021). Positive urgency has been considered as triggering factor of problematic behaviours, that are performed to maintain these positive emotions or enhance them (Billieux, Gay, Rochat & Van der Linden, 2010). It has been previously linked to other addictions such as food addiction (VanderBroek-Stice, Stojek, Beach, vanDellen & MacKillop, 2017), pathological gambling and cocaine addiction (Albein-Urios, Martínez-González, Lozano, Clark & Verdejo-García, 2012) and has been stated as a PSU risk factor (Billieux et al., 2010). Individuals with a high positive urgency have shown to be more vulnerable to cognitive interference by the presence of a smartphone device (Canale et al., 2019). The third and last impulsivity trait characterizing the SA group is lack of premeditation, also linked to addictive disorders and risky behaviours (López-Torres, León-Quismondo & Ibáñez, 2021; Minhas et al., 2021) and to PSU (Canale et al., 2021). Not valuing the consequences of the excessive use might be responsible for the damage the development of SA causes on the social, work, or academic-related domains. Lack of perseverance and sensation seeking are both present in the ESU and the SA group. Lack of perseverance could be associated to an excessive smartphone usage stated by its relation with procrastination (Rozgonjuk, Kattago & Täht, 2018) and distraction (Canale et al., 2019); and sensation seeking for the compulsive seeking of the positive and novel rewards these devices are constantly offering (Wang et al., 2019). Hence, the SA group might describe a subpopulation that is at risk of suffering or suffering already smartphone addiction.

One limitation of the present study is that it was performed on a non-probabilistic sample without the intended inclusion of any specific individuals with a PSU diagnose that could have given even more information about SA, which on the other hand is difficult as this problematic behaviour is not yet integrated in the main diagnostic manuals. Still, we found a total of $n = 99$ individuals presenting SA, which represented 24.03% of the total sample. There was also a gender imbalance, however, no differences were found between both groups. The sample and therefore the conclusions extracted are also more representative of the population with a higher educational level. In addition, research was conducted in a Spanish population, thus future studies could extend it to other countries, as the included assessment tools are validated in different languages. The occupation of the participants was not registered, which could be also a relevant sociodemographic information. Also, the activities the participants were engaging in when using their smartphones were not registered, which should be included in future studies. Finally, the survey was taken online, which could have also biased the results towards people who make more use of technology. However, the assessment was not

excessively long, and it could have been easily completed by individuals without a very regular access to technology. Yet, it would be desirable for future studies to also perform face-to-face and paper-and-pencil data collection to obtain more representative samples.

The present study constituted an examination of PSU considering individual differences based on the impulsivity personality traits. The resulting description of the three existing groups might contribute to better discern ESU from SA through the specific impulsivity dimensions present in SA: negative urgency, positive urgency and lack of premeditation. These profiles can be considered when addressing future vulnerability studies, prevention and intervention programs, that should focus on training inhibitory control but especially these three dimensions of impulsivity aiming to avoid the future development of SA.

Conflict of interests

The authors declare no conflict of interest.

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ORIGINAL

Substitution of higher-strength beers with zero-alcohol beers: Interrupted time series analyses of Spanish household purchase data, 2017-2022

Sustitución de cervezas de mayor graduación alcohólica por cervezas sin alcohol: Análisis de series temporales interrumpidas de datos de compra de los hogares españoles, 2017-2022

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Abstract

In its action plan (2022-2030) to reduce the harmful use of alcohol, WHO calls on economic operators to “substitute, whenever possible, higher-alcohol products with no-alcohol and lower-alcohol products in their overall product portfolios, with the goal of decreasing the overall levels of alcohol consumption in populations and consumer groups”. This paper investigates substitution within beer brands at the level of the consumer, based on Spanish household purchase data using interrupted time series analysis. For households ($n = 1791$, 9.1% of all households) that newly bought at least one of eleven branded zero-alcohol beers (responsible for over three-quarters of all zero-alcohol beer purchased), the associated purchases of all grams of alcohol after the first purchase of zero-alcohol beer were reduced by 5.5%, largely due to substituting every one litre of higher strength beer ($ABV > 3.5\%$) with 0.75 litres of same-branded zero-alcohol beer ($ABV = 0.0\%$). For households ($n = 337$, 1.8% of all households) that had never previously purchased a same-branded higher-strength beer, but newly purchasing a same-branded zero-alcohol beer, the associated purchases of all grams of alcohol after the first purchase of zero-alcohol beer were reduced by 14%; this reduction was largely due to such households’ decreasing their associated purchases of wines and spirits. Thus, at the level of the consumer, based on Spanish household purchase data of branded zero-alcohol beers, the evidence behind WHO’s call for substitution appears to be substantiated.

Keywords: zero-alcohol beer, substitution, household purchases, ARIMA modelling

Resumen

En su plan de acción (2022-2030) para reducir el uso nocivo del alcohol, la OMS pide a los operadores económicos que «sustituyan, siempre que sea posible, los productos con alto contenido de alcohol por productos sin alcohol y con bajo contenido alcohólico, con el objetivo de disminuir los niveles generales de consumo de alcohol en las poblaciones y los grupos de consumidores». Este artículo investiga la sustitución dentro de las marcas de cerveza a nivel del consumidor, a partir de los datos de compra de los hogares españoles mediante análisis de series temporales interrumpidas. Para los hogares ($n = 1791$, 9,1% de todos los hogares) que compraron recientemente al menos una de las once cervezas 0,0% (responsables de más de tres cuartas partes de toda la cerveza sin alcohol comprada), las compras asociadas de todos los gramos de alcohol después de la primera compra de la cerveza 0,0% se redujeron en un 5,5%, en gran parte debido a la sustitución de cada litro de cerveza con graduación alcohólica $> 3,5\%$ con 0,75 litros de cerveza 0,0% de la misma marca. Para los hogares ($n = 337$, 1,8% de todos los hogares) que nunca antes habían comprado una cerveza de mayor graduación de la misma marca, pero que compraron recientemente una cerveza 0,0% de la misma marca, las compras asociadas de todos los gramos de alcohol después de la primera compra de la cerveza 0,0% se redujeron en un 14%; esta reducción se debió en gran parte a que los hogares disminuyeron sus compras asociadas de vinos y licores. Así, a nivel del consumidor, en base a los datos de compra de cervezas 0,0% por parte de los hogares españoles, parece estar fundamentada la evidencia detrás del llamamiento de la OMS a la sustitución.

Palabras clave: cerveza sin alcohol, sustitución, compras del hogar, modelado ARIMA

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The risk of damaged health and the likelihood of early death is greater the higher the level of alcohol consumption from a nadir of five grams of alcohol per day (GBD 2020 Alcohol Collaborators, 2022). To reduce the risk, consumers need to drink less alcohol. WHO, in its action plan (2022–2030) to reduce the harmful use of alcohol, further to the “continued enforcement of high-impact cost-effective policy options included in its SAFER technical package” (World Health Organization, 2019), called on ‘economic operators’ to “substitute, whenever possible, higher-alcohol products with no-alcohol and lower-alcohol products in their overall product portfolios, with the goal of decreasing the overall levels of alcohol consumption in populations and consumer groups.” (World Health Organization, 2022).

To have an impact on people’s drinking, WHO’s call to economic operators needs to follow through to substitution at the level of the consumer (Anderson, Kokole, Jané Llopis, Burton & Lachenmeier, 2022a; Anderson, Kokole & Llopis, 2021; Rehm, Lachenmeier, Jané Llopis & Imtiaz, 2016). WHO’s call is premised on the likelihood that economic operators will enact substitution within brands (Anderson, Jané Llopis & Rehm, 2020). Elsewhere, based on British household purchase data, we have demonstrated that consumers do substitute higher-strength alcohol beers with newly introduced lower-strength beers within brands (Anderson, Llopis, O’Donnell, Manthey & Rehm, 2020). The downside of the British analysis is, though, that it is based on just one jurisdiction - Great Britain. In this paper, we examine substitution within beer brands based on analyses of Spanish household purchase data for the period 2nd quarter 2017 to end of 1st quarter 2022. Since substitution of higher-strength beers with zero-alcohol beers (ABV = 0.0%) (alcohol by volume [ABV]) could have a greater impact in reducing consumptions of grams of alcohol than substitution with no-alcohol beers (ABV ≤ 1.0%), we examine potential substitution with zero-alcohol beers.

Since the 1970s, there have been large decreases in per capita levels of alcohol consumption in Spain, largely due to decreases in wine and spirits consumption and increases in beer consumption, such that Spain is now predominantly a beer-drinking country (Llamosas-Falcón, Manthey & Rehm, 2022). There are a range of factors that might explain the decreases and shifts in consumption, including beer becoming relatively cheaper than wine, cultural shifts with decreased drinking at lunch time, and government policies regulating purchase age, advertising, and licensing premises to sell alcohol (Matrai et al. 2014; Llamosas-Falcón et al., 2022). Over the last ten years, consumption has remained relatively stable (Llamosas-Falcón et al., 2022). In Spain (Anderson & Kokole, 2022), as a proportion of all beer purchases, purchases of zero-alcohol beers (ABV = 0.0%) are nearly six-fold higher than in Great Britain

(Anderson, O’Donnell, Jané Llopis & Kaner, 2022b). This paper considers the extent to which households that newly purchase zero-alcohol beers decrease their purchases of same-branded higher-strength beers, and the extent to which this might vary by sociodemographic attributes of the households. We also consider for households that had never previously purchased a same-branded higher-strength beer, the extent to which new purchases of the same-branded zero-alcohol beer led to subsequent purchases of the same-branded higher-strength beers and how this impacted the overall numbers of grams of alcohol purchased. Our data source is restricted to purchase data, and thus we can only analyse changes in purchases, rather than the mechanisms that lead to changes in purchases. We cannot assess the extent to which changes in purchases were driven by consumer demand or by marketing strategies of the alcohol producers.

The two specific hypotheses to be tested are:

1. For households that had previously purchased same-branded higher-strength beers, new purchases of zero-alcohol beers are associated with reduced purchases of all grams of alcohol; and,
2. For households that had not previously purchased same-branded higher-strength beers, new purchases of zero-alcohol beers are not associated with increases in purchases of all grams of alcohol. This hypothesis considers the extent to which producers of a given brand might use zero-alcohol beers as products to induce consumers to buy subsequently their higher-strength products.

Methods

Study design

We use interrupted time series analyses to investigate the potential impact of new purchases of zero-alcohol beers on changes in purchases of grams of all alcohol over time.

Data source

Our data source is Kantar Worldpanel’s (KWP) household shopping panel. KWP comprises approximately 12,000 Spanish households at any one time, recruited via stratified sampling, with targets set for province, household size, and age of main shopper, with the panel being representative of households in Spain as a whole. Households provide demographic information when joining the panel, followed by annual updates and quality checks. Using barcode scanners, households record all alcohol purchases brought into the home from all store types, including Internet shopping.

We analysed raw KWP data on take-home purchasing of alcohol products in Spain for the time-period second quarter of 2017 to end of first quarter of 2022. For each individual purchase, the provided data included the type and volume

of the purchase, the brand, and the alcohol by volume (ABV). The provided data categorized each purchase as either a beer, a wine, a sparkling wine, or a spirits-based product. The volume purchased was combined with ABV to calculate grams of alcohol purchased. Households were grouped by age of main shopper, social grade, Autonomous Community, and level of alcohol purchases supplement Table 1, supplement pages 1-2.

Our inclusion criteria were a branded zero-alcohol beer (ABV = 0.0%) with at least 1,000 separate purchases across all households and the five-year time period, and that had a same-branded higher-strength beer; this resulted in eleven zero-alcohol beers. We summed volumes and grams of purchased alcohol across all the eleven beers, treating them for the analyses as though they were one product. We prepared data by, first, for any day that a household bought alcohol, summing the amount of alcohol purchased in both volume and grams, divided by the number of adults in the household. Then, for each day of the time-period (second quarter of 2017 to end of first quarter of 2022), we calculated the mean volume and grams of purchases across all households for all products and for beers separated into: zero-alcohol (ABV = 0.0%); non-zero low-alcohol beers (ABV > 0.0% and ≤ 3.5%); and all other beers (ABV > 3.5%).

We made two separate classifications of households that had made any purchase of any one of the branded beers:

- i. Into those that made the first purchase of one of the branded zero-alcohol beers after a period of at least 12 months (and, for sensitivity analyses, both six and 18 months) since the first purchase of one of the same-branded higher-strength beers (ABV > 3.5%), defined as newly purchasing (NP) households, and all other households, defined as non-newly purchasing (N-NP) households;
- ii. For households that had made the first purchase of one of the branded zero-alcohol beers after a period of at least six months since the first purchase of any alcohol product, into those that had not bought a same-branded higher-strength beer (ABV > 3.5%) prior to the first purchase of the same-branded zero-alcohol beer ([−ve > 3.5%]| [+ve 0.0%] households) and those that had bought a same-branded higher-strength beer prior to the first purchase of the same-branded zero-alcohol beer ([+ve > 3.5%]| [+ve 0.0%] households).

We adjusted the study days as follows: for each household, we set the first day of the new purchase of a zero-alcohol branded beer as day 0, numbering all other days as minus days before the purchase and plus days after the purchase.

Statistical analyses

We used generalized linear models to estimate the odds ratio of being a newly purchasing household compared with other households by the socio-demographic attributes of the households. We present the odds ratios with 95% confidence intervals. For details, see supplement page 3.

Hypothesis 1: For households that had previously purchased same-branded higher-strength beers, new purchases of zero-alcohol beers are associated with reduced purchases of all grams of alcohol

Our primary dependent variable was grams of all alcohol purchased per adult per household per day of purchase, averaged per adjusted study day.

Our secondary dependent variables were:

- Volume of purchases (millilitres) of the zero-alcohol branded beer (ABV = 0.0%);
- Volume of purchases (millilitres) of the low-alcohol branded beer (ABV > 0.0% and ≤ 1.0%);
- Volume of purchases (millilitres) of the higher-strength branded beer (ABV > 3.5%);
- Grams of alcohol within all of the same-branded beers;
- Volume of purchases (millilitres) of all other higher-strength beer (ABV > 3.5%);
- Volume of purchases (millilitres) of wines with an ABV > 8.5%;
- Volume of purchases (millilitres) of spirits with an ABV > 38%.

Using a generalized linear model, we undertook before-the event and after-the event analyses to assess the associated impact of the event, the first day of purchase of a zero-alcohol beer that defines a newly purchasing household. The event was dummy-coded as 0 for all days prior to the event and 1 for all days from the event forwards. We repeated the before- and after-analysis investigating the interaction between the grouped level of alcohol consumption of the household prior to the event and the event (noting that such interaction analysis is not possible with interrupted time series analyses). For details, see supplement pages 4-5.

We also used interrupted time series analyses to assess the associated impact of the event. As sensitivity analyses, we repeated the model, setting, for each household, the period between the first purchase of the same-branded higher-strength beer and the same-branded zero-alcohol beer as either six months or 18 months (as opposed to 12 months for the main analyses). We report unstandardized coefficients and 95% confidence intervals. For details, see supplement pages 5-6.

Hypothesis 2: For households that had not previously purchased same-branded higher-strength beers, new purchases of zero-alcohol beers are not associated with increases in purchases of all grams of alcohol.

Our primary dependent variable was grams of all alcohol purchased per adult per household per day of purchase, averaged per adjusted study day.

Our secondary dependent variables were:

- Volume of purchases (millilitres) of the zero-alcohol branded beer ($ABV = 0.0\%$);
- Volume of purchases (millilitres) of the higher-strength branded beer ($ABV > 3.5\%$);
- Volume of purchases (millilitres) of all other higher-strength beer ($ABV > 3.5\%$);
- Volume of purchases (millilitres) of wines with an $ABV > 8.5\%$;
- Volume of purchases (millilitres) of spirits with an $ABV > 38\%$.

As for hypothesis 1, we used a generalized linear model to undertake before-the event and after-the event analyses to assess the changes in volume of purchases of both the zero-alcohol and higher-strength branded beers following the first purchase of the zero-alcohol branded beer.

As for hypothesis 1, we used interrupted time series analyses to assess the associated impact of the event (the first purchase of the zero-alcohol beer) on purchases of all grams of alcohol. The event was dummy-coded as 0 for all days prior to the event and 1 for all days from the event forwards. We subsequently noted from plots that there were slopes in purchases over time before and after the event. Therefore, we created two dummy-coded slope variables: the study days for the slope before the event were dummy-coded as 0 for all days from the event forwards; and for the study days for the slope after the event were dummy-coded as 0 for all days prior to the event.

All analyses were performed with SPSSv27 (IBM Corp 2020).

Results

Households and purchases

We analysed data from 18,954 Spanish households with 1.29 million separate alcohol purchases between the beginning of the second quarter of 2017 to the end of the first quarter of 2022. Out of the volume of all zero-alcohol beers purchased, 105.0 ml (95% CI = 103.4 to 106.7) (per adult per household per day of purchase per study day, averaged over all study days and all households), 79.5ml (95% CI = 78.0 to 80.9), 75.5%, was from one of the eleven included branded beers.

Hypothesis 1: At the household level, new purchases of zero-alcohol beers are associated with decreased purchases of same-branded higher-strength beers, resulting in reduced purchases of all grams of alcohol

Out of the 18,954 households, 17,283 (91.2%) had made at least one purchase of beer, 15,797 (83.3%) had made

at least one purchase of one of the branded beers and 6,911 (36.5%) had made at least one purchase of one of the branded zero-alcohol beers, 1,719 of which (9.1% of all households) had made the first purchase of the zero-alcohol beer at least one year after the first purchase of the same-branded beer with an $ABV > 3.5\%$ (the included newly purchasing households for the analysis). Compared with other households that had purchased a zero-alcohol branded beer, the newly purchasing households were more likely to be heavier purchasers of alcohol, tended to be older, but did not differ by social grade, and had no consistent pattern by autonomous community in which the household was located, supplement Table 2, supplement page 7.

Of the 1,719 newly purchasing households, 1,547 (90%) bought only one type out of the eleven zero-alcohol brands; of these 1,547 households, 1,238 (80%) bought the same brand of zero-alcohol beer as the previous purchases of the higher-strength branded beer ($ABV > 3.5\%$). Of the 1,719 newly purchasing households included in the analyses, Figure 1 plots on the left vertical axis the volumes of purchases (ml per adult per household per day of purchase, averaged for each adjusted day across all households) for branded zero-alcohol beer and for same-branded beer with an $ABV > 3.5\%$. On the right vertical axis, Figure 1 plots grams of alcohol purchased (grams per adult per household per day of purchase, averaged for each adjusted day across all households) for all grams of alcohol and for all grams of alcohol within the branded beers. It is important to remember that not all 1,719 households are represented in the averages for all the adjusted study days. At the left of the horizontal axis, the large negative adjusted study days include households that had the largest time interval between the first purchase of the same-branded higher-strength beers ($ABV > 3.5\%$) and the first purchase of the branded zero-alcohol beers; whereas, at the right of the horizontal axis, the large positive adjusted study days include households that had the shortest time interval between the first purchase of the same-branded higher-strength beers ($ABV > 3.5\%$) and the first purchase of the branded zero-alcohol beers. Visual inspection of the plots illustrates an initial decrease in the volume of purchases of the zero-alcohol beer, followed by a stable trend over time, mirrored by opposite changes in the volume of purchased higher-strength beers, and purchased grams of alcohol.

Table 1 displays the coefficients for the changes in the dependent variables associated with the event for both the before- and after- analyses and the interrupted time series analysis. The coefficients are similar for both sets of analyses. Using the coefficients from the interrupted time series analyses, for the primary outcome, the event was associated with a reduction in purchases of 5.5 grams (95% CI = 3.9 to 7.0) of alcohol (per adult per household per day of purchase averaged across each adjusted study

day), a 5.5% reduction. That the event, with subsequent purchases of zero-alcohol beer of 98ml (95% CI = 96 to 101) was associated with reductions at the household level in volumes of purchases of same-branded higher-strength beer (-73 ml, 95% CI = -90 to -56), an 11% reduction, is consistent with substitution. Since the first day of new purchases of zero-alcohol beer, every one litre of higher-strength beer (ABV > 3.5%) was substituted with 0.745 litres (95% CI = 0.736 to 0.753) of same-branded zero-alcohol beer (ABV = 0.0%), this ratio increasing over time, regression coefficient per 100 days, 0.022 (95% CI = 0.019 to 0.024), supplement Figure 3, page 8.

That the associated reductions in purchases of grams of all alcohol might be due to the reductions in purchases of the higher-strength branded beer (ABV > 3.5%), is suggested by that, when including the purchase volumes of higher-strength branded beer as an independent variable in the model for the associated changes in purchases of grams of all alcohol as dependent variable, the coefficient for the associated changes in purchases of grams of alcohol dropped to 1.9 grams, with relatively wide 95% confidence intervals, 0.12 to 3.70.

The sensitivity analyses, with the time intervals between the first purchase of the same-branded higher-strength beer and the same-branded zero-alcohol beer as either six months or 18 months (as opposed to 12 months for the main analyses) found very similar results, supplement Table 3, supplement page 9, with the exception that the associated reductions in purchases of the volume of same-branded higher-strength beers and reductions in purchases of grams of alcohol in all branded beers seemed larger the longer the time interval.

When analysing by groups of the amount of alcohol normally purchased prior to the first purchase of the newly-purchased zero-alcohol beer, the normal heavier buyers of alcohol had greater reductions in the volume of purchases of same-branded higher-strength beer and greater reductions in purchases of alcohol than lighter buyers of alcohol, supplement Table 4 supplement page 10, confirmed by the interaction analysis, supplement Table 5, supplement page 10, where the highest purchasing group reduced their purchase of grams of alcohol by 11.2 grams (95% CI = 8.4 to 14.0) more than the lowest purchasing group.

Figure 1

Left vertical axis plots the volumes of purchases (ml per adult per household per day of purchase, averaged for each adjusted day across all households) for branded zero-alcohol beer (ABV = 0.0%) and for same-branded beer with an ABV > 3.5%. Right vertical axis plots grams of alcohol purchased (grams per adult per household per day of purchase, averaged for each adjusted day across all households) for all grams of alcohol and for all grams of alcohol within the branded beers. Dots: daily data points, predicted values from ARIMA models. Black vertical line: Day of first purchase of newly purchased zero-alcohol branded beer

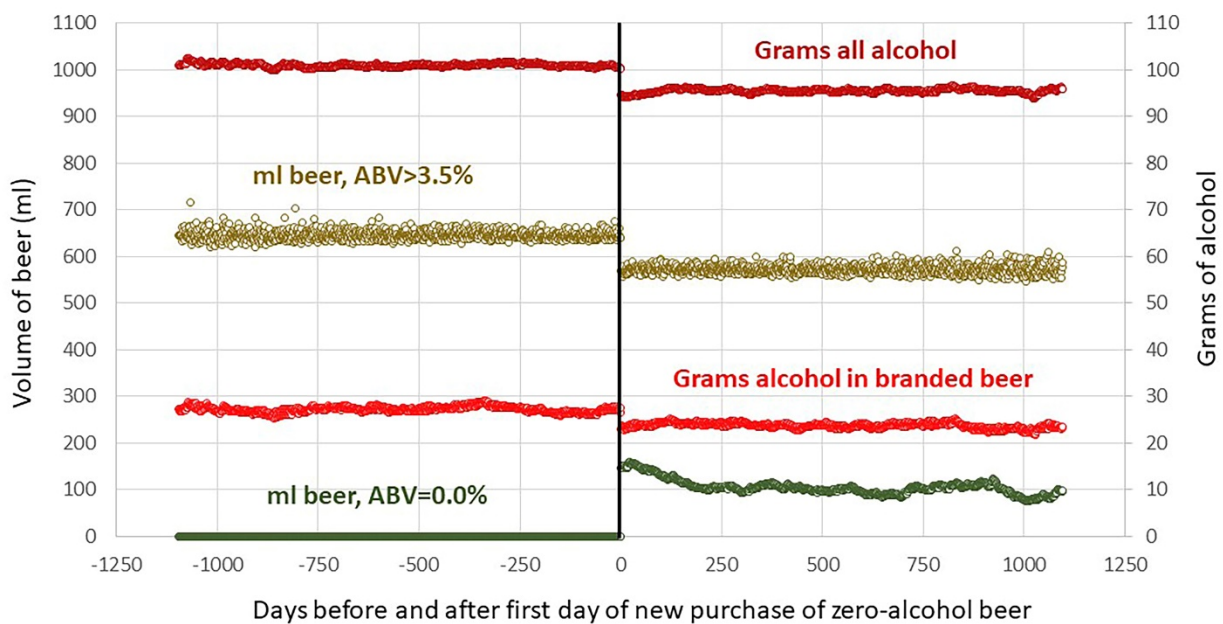


Table 1

Coefficients (95% confidence intervals) for the changes in the dependent variables associated with the event for both the before- and after- analyses and the interrupted time series analysis

Dependent variables	Before and after analyses		Interrupted time series analyses
	Intercept	Event	
Branded zero-alcohol beer (ml)	0.0	97.81 (93.74 to 101.88)	98.22 (95.64 to 100.86)
Branded low-alcohol beer (ABV > 0.0 and ≤ 3.5%) (ml)	101.79 (97.72 to 105.86)	-8.86 (-14.61 to -3.10)	-8.81 (-14.98 to -2.63)
Branded higher-strength beer (ABV > 3.5%) (ml)	645.31 (633.78 to 656.84)	-73.28 (-89.59 to -56.98)	-73.31 (-90.39 to -56.22)
Grams of alcohol in all branded beers	27.17 (26.73 to 27.62)	-3.46 (-4.09 to -2.83)	-3.48 (-4.57 to -2.39)
Grams of alcohol in all products	100.92 (100.00 to 101.84)	-5.43 (-6.73 to -4.12)	-5.45 (-7.01 to -3.88)
Other non-branded beer (ABV > 3.5%) (ml)	434.41 (425.00 to 443.81)	-24.67 (-37.98 to -11.37)	-24.67 (-37.97 to -11.38)
Wine (ABV > 9.5%) (ml)	361.01 (360.55 to 361.47)	1.33 (.68 to 1.98)	-1.14 (-2.12 to -.15)
Spirits (ABV > 35%) (ml)	27.95 (27.85 to 28.04)	1.89 (1.76 to 2.02)	Non-significant

Hypothesis 2: For households that had not previously purchased same-branded higher-strength beers, new purchases of zero-alcohol beers are not associated with increases in purchases of all grams of alcohol.

Out of the 6,911 households that had made at least one purchase of one of the branded zero-alcohol beers, 3,458, 50% (18.2% of all households) made their first purchase of a branded zero-alcohol beer at least six months after their first purchase of any alcohol product, of which 337 (9.7%) had never previously purchased a same-branded higher-strength beer ($[-ve > 3.5\%][+ve 0.0\%]$ households), and 3,121 (93.3%) had previously purchased a same-branded higher-strength beer ($[+ve > 3.5\%][+ve 0.0\%]$ households). Figure 2, which plots purchases over time, shows that $[-ve > 3.5\%][+ve 0.0\%]$ households purchased slightly greater volumes of zero-alcohol beer (134.4 ml, 95% CI = 132.8 to 135.9) than $[+ve > 3.5\%][+ve 0.0\%]$ households (105.6 ml, 95% CI = 104.6 to 106.5), difference = 28.8ml (95% CI = 27.0 to 30.7). For same-branded higher-strength beer, $[-ve > 3.5\%][+ve 0.0\%]$ households subsequently made purchases, but much less in volume over the same time period (181.9 ml, 95% CI = 178.3 to 185.5) than $[+ve > 3.5\%][+ve 0.0\%]$ households (555.8 ml, 95% CI = 554.3 to 557.3), difference = 373.9 ml (95% CI = 370.0 to 377.8). Over the whole time since the first purchase of zero-alcohol beer, for every one litre of zero-alcohol beer (ABV = 0.0%) purchased, 1.22 litres (95% CI = 1.18 to 1.25) of higher-strength beer (ABV > 3.5%) were purchased, the ratio increased during the first year, and thereafter remained relatively stable for the next two years (the length of time of analysis) at 1.61 (95% CI = 1.58 to 1.64), decreasing slightly over time during the final two years, per every 100 days over the two years, coefficient =

-0.012 (95% CI = -0.017 to -0.0074), supplement Figure 4, supplement page 11.

For grams of all alcohol, $[-ve > 3.5\%][+ve 0.0\%]$ households showed a trend of increasing purchases prior to their first purchase of zero-alcohol beer, with this trend reversing after their first purchase, Table 2. Overall, subsequent to the first purchase of the zero-alcohol beer, $[-ve > 3.5\%][+ve 0.0\%]$ households reduced their associated purchases of grams of all alcohol by a greater amount than $[+ve > 3.5\%][+ve 0.0\%]$ households, difference, 6.63 grams (95% CI = 6.05 to 7.20), Table 2. This could be due the fact that whilst $[-ve > 3.5\%][+ve 0.0\%]$ households increased their associated purchases of other beer by a greater amount than $[+ve > 3.5\%][+ve 0.0\%]$ households, difference, 79.5 ml (78.7 to 80.3), they decreased their associated purchases by a greater amount of both wine, difference, 68.7 ml (63.6 to 73.8) and spirits, difference, 14.9 ml (13.9 to 15.8) than $[+ve > 3.5\%][+ve 0.0\%]$ households, Table 2.

That this might be the case is suggested by, that, when including the purchase volumes of other beer, spirits and wines as independent variables in the model for the associated changes in purchases of grams of all alcohol as dependent variable, the coefficient for the associated changes in purchases of grams of alcohol was no longer significant and excluded from the model for $[-ve > 3.5\%][+ve 0.0\%]$ households.

Discussion

Main findings

We analysed data from Spain, since this is one of the European countries with the highest proportion of beer purchases that are zero- and no-alcohol (Kokole, Jané

Llopis & Anderson 2021). We studied eleven zero-alcohol beers that had same-branded higher-strength beers, and that were responsible in volume terms, for 75.5% of all purchased zero-alcohol beer over the time period, second quarter of 2017 to end of first quarter of 2022.

For our first hypothesis (for households that had previously purchased same-branded higher-strength beers, new purchases of zero-alcohol beers are associated with reduced purchases of all grams of alcohol), we analysed the purchasing behaviour of 1,719 households (9.1% of all households in the data set) that had made a first purchase

of the branded zero-alcohol beer ($ABV = 0.0\%$) at least one year after the first purchase of the same-branded beer with an $ABV > 3.5\%$, calling such households newly purchasing households of zero-alcohol beer. Eighty percent of newly purchasing households bought the same brand of zero-alcohol beer as the brand of the higher-strength beer that they had previously bought.

The first hypothesis is confirmed. New purchases of zero-alcohol beers were associated with reduced purchases of all grams of alcohol by, on average, 5.5%. The volume of associated new purchases of same-branded zero-alcohol

Figure 2

Left vertical axis plots the volumes of purchases (ml per adult per household per day of purchase, averaged for each adjusted day across all households) for branded zero-alcohol beer ($ABV = 0.0\%$) and for same-branded beer with an $ABV > 3.5\%$. Right vertical axis plots grams of alcohol purchased (grams per adult per household per day of purchase, averaged for each adjusted day across all households) for all grams of alcohol. Separate plots for $[-ve > 3.5\%][+ve 0.0\%]$ and $[+ve > 3.5\%][+ve 0.0\%]$ households. Dots: daily data points, predicted values from ARIMA models. Black vertical line: Day of first purchase of newly purchased zero-alcohol branded beer

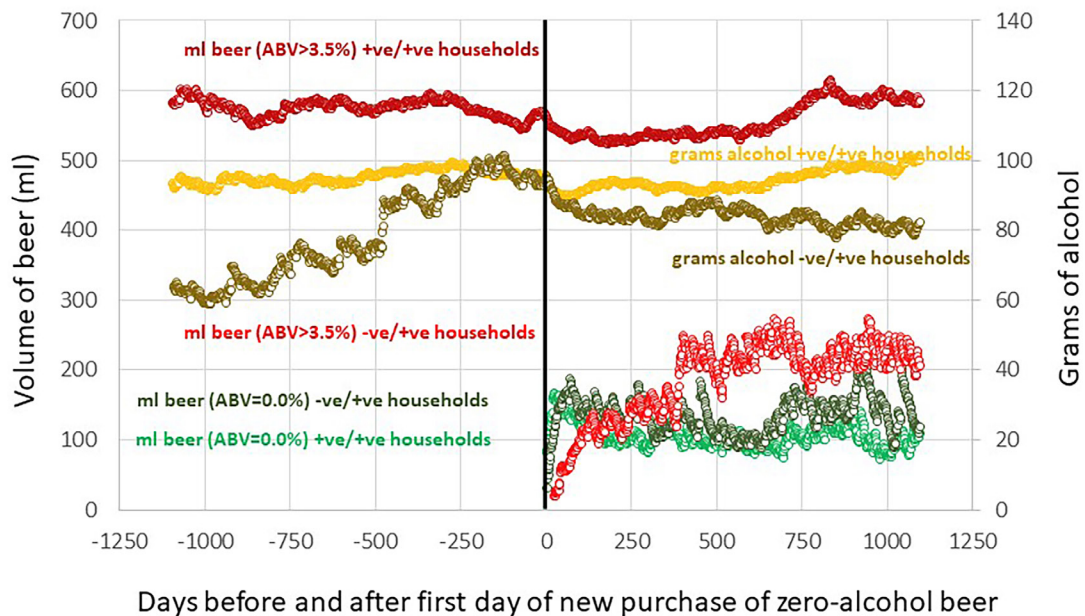


Table 2

Coefficients (95% confidence intervals) for the changes in the dependent variables associated with the event for the interrupted time series analysis

	Grams all alcohol		Volume other beer (ml)		Volume spirits (ml)		Volume wine (ml)	
	$[-ve > 3.5\%][+ve 0.0\%]$ households	$[+ve > 3.5\%][+ve 0.0\%]$ households	$[-ve > 3.5\%][+ve 0.0\%]$ households	$[+ve > 3.5\%][+ve 0.0\%]$ households	$[-ve > 3.5\%][+ve 0.0\%]$ households	$[+ve > 3.5\%][+ve 0.0\%]$ households	$[-ve > 3.5\%][+ve 0.0\%]$ households	$[+ve > 3.5\%][+ve 0.0\%]$ households
Intercept	101.0 (100.6 to 101.4)	97.3 (97.2 to 97.5)	371.449 (371.449 to 371.449)	427.202 (426.653 to 427.751)	35.508 (34.817 to 36.198)	27.485 (27.314 to 27.656)	543.760 (540.162 to 547.358)	376.335 (375.382 to 377.288)
Slope prior to event	.041 (.039 to .042)	.0039 (.0036 to .004)	Non-significant	.025 (.024 to .026)	.004 (.003 to .006)	Non-significant	.281 (.275 to .288)	.047 (.046 to .049)
Event	-14.2 (-14.7 to -13.6)	-7.3 (-7.5 to -7.1)	54.015 (54.015 to 54.015)	-25.451 (-26.228 to -24.674)	-11.810 (-12.769 to -10.852)	3.044 (2.803 to 3.286)	-103.362 (-108.372 to -98.351)	-34.667 (-36.016 to -33.318)
Slope after event	-.0053 (-.0059 to -.005)	.0077 (.0074 to .008)	Non-significant	.014 (.013 to .015)	Non-significant	.001 (.001 to .001)	-.095 (-.100 to -.089)	.003 (.001 to .004)

beer (98 ml) was matched with reductions in purchases of regular strength beer ($ABV > 3.5\%$) of 73 ml, a substitution ratio of 74.5% that increased slightly over three years (the length of time of follow-up analysis). Households that bought the most alcohol to begin with showed evidence of greater substitution. That, together with newly purchasing households being heavier purchasers of alcohol in general could be interpreted that such households were purchasing zero-alcohol beers in an attempt to reduce their alcohol purchases, and thus alcohol consumption.

For our second hypothesis (for households that had not previously purchased same-branded higher-strength beers, new purchases of zero-alcohol beers are not associated with increases in purchases of all grams of alcohol), we analysed the purchasing behaviour of 3,458 households (18.2% of all households in the data set) that had made at least one purchase of one of the branded zero-alcohol beers at least six months after their first purchase of any alcohol product, dividing them into 337 households that had never previously purchased a same-branded higher-strength beer ($[-ve > 3.5\%][+ve 0.0\%]$ households), and 3,121 that had previously purchased a same-branded higher-strength beer ($[+ve > 3.5\%][+ve 0.0\%]$ households).

With respect to no increases in purchases of all grams of alcohol, the second hypothesis is confirmed. There were no associated increases in purchases of grams of alcohol; rather, for $[-ve > 3.5\%][+ve 0.0\%]$ households, new purchases of zero-alcohol beers were associated with reduced purchases of all grams of alcohol by, on average, 14%, larger than the 7.5% associated reduction for $[+ve > 3.5\%][+ve 0.0\%]$ households. Whilst $[-ve > 3.5\%][+ve 0.0\%]$ households followed their new purchases of zero-alcohol beer with associated increased purchases of both same-branded higher-strength beer and other beers (with such purchases being, respectively, about one-third and one-sixth of the equivalent volumes purchased by $[+ve > 3.5\%][+ve 0.0\%]$ households), their associated purchases of the volumes of both wine and spirits were reduced. The associated 14% reductions in purchases of all grams of alcohol were fully explained by the associated reduced purchases of wines and spirits. Thus, it seems that households that had not previously purchased a higher-strength branded beer that went on to newly buy a same-branded zero-alcohol beer were shifting their purchases from higher-strength alcohol products (wines and spirits) to lower strength alcohol products (beer), with new beer purchases split roughly two-fifths zero-alcohol beer and three-fifths higher-strength beer, with the proportion of zero-alcohol beer increasing slightly over time during the second two years of follow-up. This shift at the level of household purchases is consistent with what has occurred throughout Spain as a whole over the last 50 years, where there have been large decreases in per capita levels of alcohol consumption, largely due to shifts from wine and spirits consumption to beer consumption (Llamosas-Falcón et al., 2022).

What is already known on this topic

The only other similar studies that we are aware of are our own studies of British household purchase data with over four million alcohol purchases from 64,280 households for the years 2015-2018, that is a data set some 3.4 times larger than the Spanish set (Jané Llopis, O'Donnell, Kaner & Anderson, 2022). The study investigated the extent to which the launch of six new zero ($ABV = 0.0\%$) and low-alcohol ($ABV > 0.0\%$ and $\leq 3.5\%$) beers affected the volume of purchases of higher-strength beers ($ABV > 3.5\%$). British households that had previously bought same-branded regular-strength beers and that went on to buy newly-introduced same-branded no- and low-alcohol beers subsequently reduced purchases of the regular-strength beers by 48.5 ml per adult per household per day for days in which a purchase was made, a 22.5% reduction, matched by new purchases of 34.6 ml of the new no- and low- alcohol beers, with such changes stable over at least two years follow-up (the length of time available for analyses). Looking at all households that had not previously bought one of the higher-strength branded beers, those households that went on to buy one of the newly introduced same-branded zero or low alcohol beers did subsequently buy same-branded higher-strength beer, but by only half as much as those households that had not gone on to buy one of the newly introduced zero or low alcohol beers.

What this study adds

A strength of the study is that we include a large number of alcohol purchases from a large number of households, with large numbers of data points before and after the examined event, with scanned barcode data providing objective data. Examining household purchases in Spain, with a very different drinking culture than that of Great Britain, found evidence for substitution at the ratio of 75% and reduced purchases of grams of alcohol. The associated reductions in purchased grams of alcohol were greater the higher the initial level of overall alcohol purchases. Households that had not previously bought a branded higher-strength beer and subsequently bought a branded zero-alcohol beer had overall associated reductions in purchases of grams of alcohol due to shifting associated purchases from wines and spirits to beer; these households did go on to buy the same-branded higher-strength beer, but to a lesser extent (about one third the volume) than households that had previously bought a branded higher-strength beer.

Limitations of the study

A main limitation of the study is that we are only able to assess changes in household alcohol purchases from shops and supermarkets, and exclude alcohol consumed from cafés, bars and restaurants. Further, we only examine purchases and not actual levels of alcohol consumption for the time periods studied. Adults in a household may not

have an equal share of the alcohol purchased, and not all adults in a household may be drinkers. The data also have limitations, with alcohol purchases tending to be under-reported in these types of datasets (Leicester, 2012).

Conclusions

Within brands of beer, household purchases, in both Spain and Great Britain, seem to confirm WHO's intended model of change when WHO called on economic operators to "substitute, whenever possible, higher-alcohol products with no-alcohol and lower-alcohol products in their overall product portfolios, with the goal of decreasing the overall levels of alcohol consumption in populations and consumer groups". The examined data found both substitution and decreased purchases of grams of alcohol overall. There needs to be expanded research across different jurisdictions to monitor the impact of potential substitution on consumer behaviour and public health, including what facilitates substitution and any potential unintended consequences of substitution. Substitution is an addition to, and not a replacement of, the elements in WHO's SAFER initiative that need to be implemented to reduce the harmful use of alcohol,³ without interference from alcohol producers.^{3,6}

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Contributors

PA conceptualised the paper, undertook the analyses and prepared the draft of the paper. DK refined the various versions of the full paper and approved the final manuscript for submission. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted. All authors had access to the data used for analyses, and all authors verified the raw data sets received from Kantar Worldpanel and are the guarantors for the data used for the analyses.

Conflict of interests

P.A. and D.K. received funds from the European Health and Digital Executive Agency under a service contract.

Ethical approval

Not required.

Data sharing

No additional data available. Kantar Worldpanel data cannot be shared due to licensing restrictions.

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Supplement

Supplement Table 1
Divisions of households by socio-demographic characteristics (N = 18,954 households)

Group	GDP per capita (€)	Categories	Number of households within each group	Distribution within each group (%)
Age of the main shopper (years)		18-34	3668	19.4
		35-49	7690	40.6
		50-64	5634	29.7
		65+	1962	10.4
Social grade ^a		Medium-High and High	3397	17.9
		Medium-Medium	6375	33.6
		Medium-Low	5081	26.8
		Low	4101	21.6
Groups of weekly purchases of alcohol (grams) prior to 1 st purchase of zero-alcohol beer		≤12	3879	20.5
		>12-≤25	5601	29.6
		>25-≤49	4845	25.6
		> 49	4629	24.4
Autonomous Community	19,107	Andalusia	3319	17.5
	28,151	Aragon	547	2.9
	22,789	Asturias	444	2.3
	27,682	Balearic Islands	416	2.2
	33,223	Basque Country	788	4.2
	20,892	Canary Islands	838	4.4
	23,757	Cantabria	234	1.2
	24,031	Castile and León	1277	6.7
	20,363	Castilla- La Mancha	824	4.3
	30,426	Catalonia	3036	16.0
	35,041	Community of Madrid	2783	14.7
	18,769	Extremadura	467	2.5
	23,183	Galicia	1083	5.7
	27,225	La Rioja	136	.7
	21,269	Murcia	552	2.9
	31,389	Navarre	214	1.1
	22,426	Valencian Community	1996	10.5

^aBased on 20 variables, using Multiple Correspondences Analysis (MCA), households were factored into one of four groups as follows:

Low Grade	Medium-Low Grade	Medium-Medium Grade	Medium-High and High Grade
<i>Head of family:</i> Owners of agriculture, livestock and fisheries Employees in agriculture, livestock and fisheries No studies Other: students, retired, etc. <i>Equipment:</i> No internet No computer No mobile phone No car No microwave No vacuum cleaner No dishwasher No stereo 1 TV	<i>Head of family:</i> Lower levels of employment Primary school <i>Equipment:</i> No dishwasher 1 Bathroom 1 car 1 TV set No pay TV No electric toothbrush No housekeeper	<i>Head of family:</i> Mid management Office employees Industry and commerce employees Secondary school <i>Equipment:</i> Robotic Vacuum cleaner Dishwasher Stereo 2+ cars 2+ TV sets 2+ bathrooms Electric toothbrush	<i>Head of family:</i> High management Mid management Self-employed University <i>Equipment:</i> Housekeeper Secondary residence 3+ TV sets 2+ cars

Odds ratios for being a newly purchasing household

We estimated the odds ratios for the 1,719 households that had made the first purchase of the zero-alcohol beer at least one year after the first purchase of the same branded beer with an ABV > 3.5%, compared to the 5,192 households that had made the first purchase of the zero-alcohol beer less than one year after the first purchase of the same branded beer with an ABV > 3.5%. Households were dummy coded 0 for less than one year and 1 for one year or more for the time gap, the dependent variable (new). The independent variables were dummy coded 'yes' or 'no' for each of categories of the groups of age (age), social grade (grade), autonomous community (AC), and groups of weekly purchases of alcohol (grams) prior to 1st purchase of zero-alcohol beer (gmgroup). The SPSS syntax was:

```
GENLIN new (REFERENCE=first) BY age grade AC gmgroup (ORDER=ASCENDING)
  /MODEL age grade AC gmgroup INTERCEPT=YES
  DISTRIBUTION=BINOMIAL LINK=LOGIT
  /CRITERIA METHOD=FISHER(1) SCALE=1 COVB=MODEL MAXITERATIONS=100 MAXSTEPHALVING=5
  PCONVERGE=1E-006(ABSOLUTE) SINGULAR=1E-012 ANALYSISTYPE=3(WALD) CILEVEL=95 CITYPE=WALD
  LIKELIHOOD=FULL
  /EMMEANS TABLES=age SCALE=ORIGINAL
  /EMMEANS TABLES=grade SCALE=ORIGINAL
  /EMMEANS TABLES=gmgroup SCALE=ORIGINAL
  /EMMEANS TABLES=AC SCALE=ORIGINAL
  /MISSING CLASSMISSING=EXCLUDE
  /PRINT CPS DESCRIPTIVES MODELINFO FIT SUMMARY SOLUTION (EXPONENTIATED).
```

Interrupted Time Series Analyses

The primary outcome dependent variable is:

- Grams of all purchased alcohol, per adult per household per day of purchase.

The secondary outcome dependent variables are:

- Volume of purchases (millilitres) of the zero-alcohol branded beer (ABV = 0.0%);
- Volume of purchases (millilitres) of the low-alcohol branded beer (ABV > 0.0% and ≤ 1.0%);
- Volume of purchases (millilitres) of the higher-strength branded beer (ABV > 3.5%);
- Grams of alcohol within all of the same-branded beers;
- Volume of purchases (millilitres) of all other higher-strength beer (ABV > 3.5%);
- Volume of purchases (millilitres) of wines with an ABV > 8.5%;
- Volume of purchases (millilitres) of spirits with an ABV > 38%.

The independent variable is:

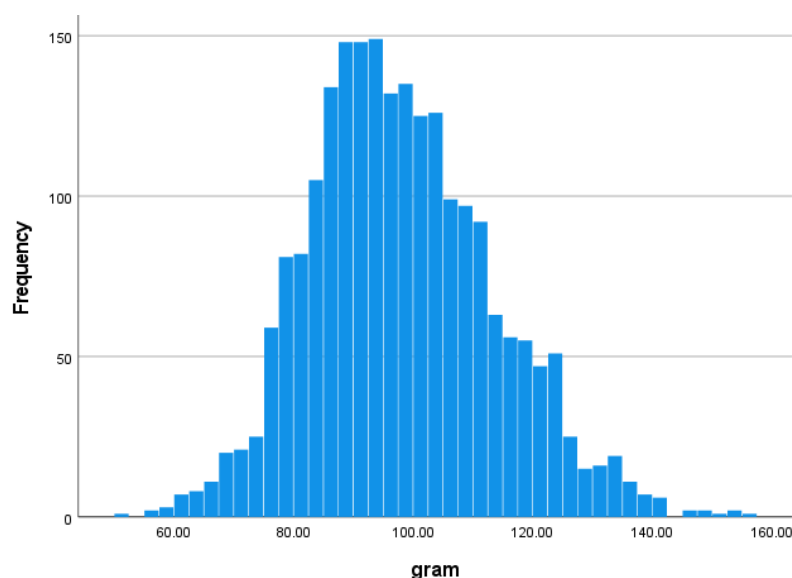
The study days were adjusted as follows: for each household, we set the first day of the new purchase of a zero-alcohol branded beer as day 0, numbering all other days as minus days before the purchase and plus days after the purchase. The event, the adjusted first day of purchase was dummy coded as zero prior to the event and as 1 from the event forwards.

Distribution of primary outcome

The primary outcome, grams of all purchased alcohol, per adult per household per day of purchase across all adjusted study days was normally distributed, Supplement Figure 1.

Supplement Figure 1

Distribution of primary outcome, grams of all purchased alcohol, per adult per household per day of purchase across all adjusted study days



Before and after analysis

We undertook before and after analyses, using the following SPSS syntax:

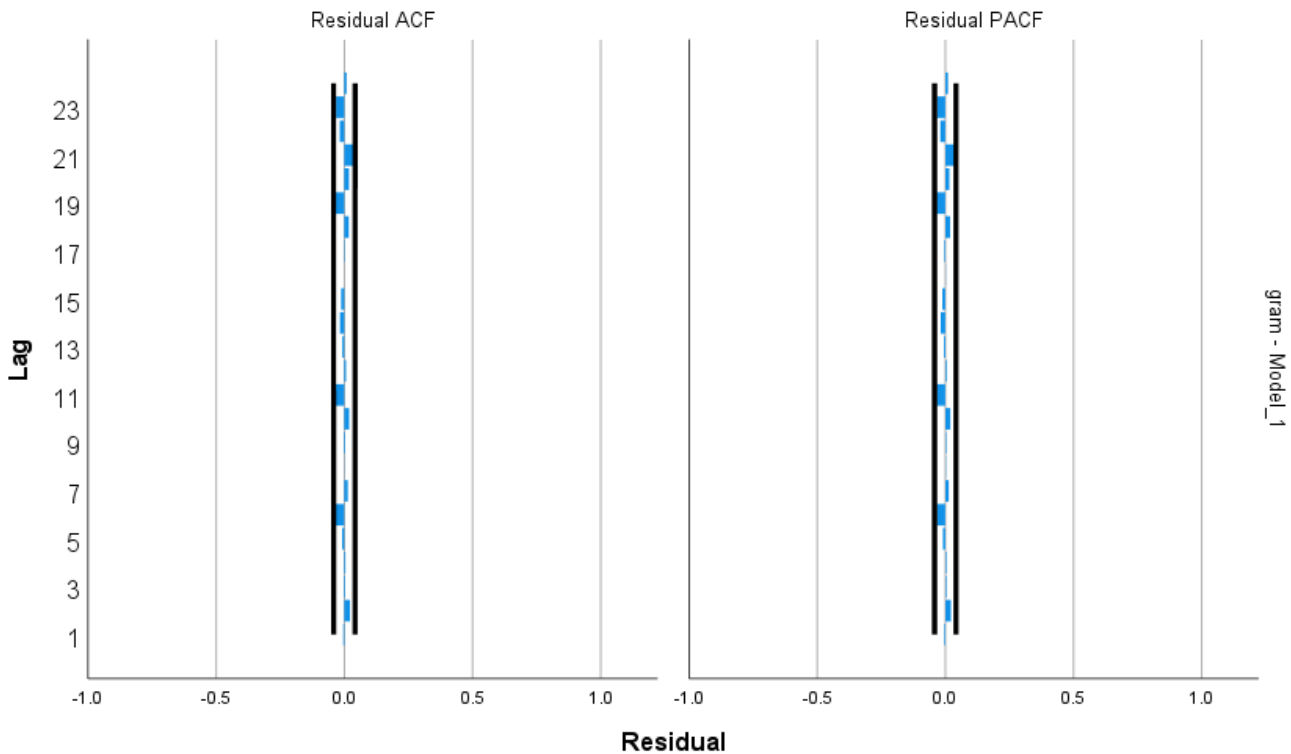
```
GENLIN gram WITH event
/MODEL event INTERCEPT=YES
DISTRIBUTION=NORMAL LINK=IDENTITY
/CRITERIA SCALE=MLE COVB=MODEL PCONVERGE=1E-006(ABSOLUTE) SINGULAR=1E-012 ANALYSISTYPE=3(WALD)
CILEVEL=95 CTYPE=WALD LIKELIHOOD=FULL
/MISSING CLASSMISSING=EXCLUDE
/PRINT CPS DESCRIPTIVES MODELINFO FIT SUMMARY SOLUTION.
```

Interrupted time series analyses

We used a time series modeler function to estimate best fitting non-seasonal and seasonal ARIMA models that: a) specify degrees of differencing and/or a square root or natural log transformation to ensure a stationary series; and, b) specify autoregressive and moving average orders. This eliminated the need to identify an appropriate ARIMA model through trial and error: (ftp://public.dhe.ibm.com/software/analytics/spss/documentation/statistics/26.0/en/client/Manuals/IBM_SPSS_Forecasting.pdf), with the ARIMA terms (1,0,1) (0,0,0) and residual ACF and PACF plots in Supplement Figure 2. The Ljung-Box Q(18) statistic was non-significant ($p = 0.90$).

Supplement Figure 2

Residual ACF and PACF of time series for grams of all purchased alcohol per adult per household per day of purchase



The SPSS syntax was:

```
TSMODEL
/MODELSUMMARY PRINT=[MODELFIT]
/MODELSTATISTICS DISPLAY=YES MODELFIT=[SRSQUARE]
/MODELDETAILS PRINT=[PARAMETERS] PLOT=[RESIDACF RESIDPACF]
/SERIESPLOT OBSERVED FIT
/OUTPUTFILTER DISPLAY=ALLMODELS
/AUXILIARY CILEVEL=95 MAXACFLAGS=24
/MISSING USERMISSING=EXCLUDE
/MODEL DEPENDENT=gram INDEPENDENT=event [E]
PREFIX='Model'
/EXPERTMODELER TYPE=[ARIMA EXSMOOTH]
/AUTOOUTLIER DETECT=OFF.
```

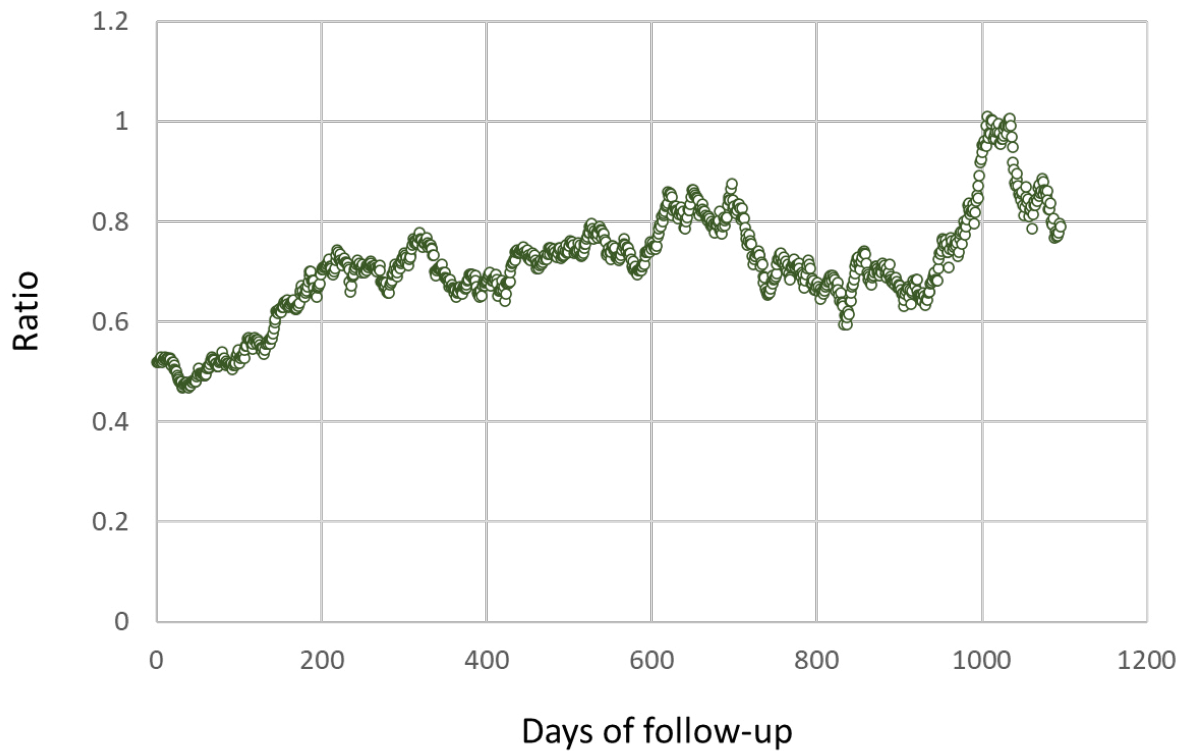
Supplement Table 2

Proportion of households making at least one new purchase of zero-alcohol beer (ABV = 0.0%) defined by day of first purchase of branded zero-alcohol beer more than 12 months after day of first purchase of same branded higher strength beer (ABV > 3.5%); odds ratios of newly buying zero-alcohol beer compared with other households that were not new purchasers of same branded zero-alcohol beer

	Proportion (95% confidence interval)	Odds ratio (95% confidence interval)
Groups of weekly purchases of alcohol (grams) prior to 1st purchase of zero-alcohol beer		
≤7	0.143 (0.124 to 0.164)	0.40 (0.33 to 0.49)
>7-≤21	0.239 (0.218 to 0.262)	0.76 (0.65 to 0.89)
>21-≤56	0.295 (0.270 to 0.321)	1.01 (0.87 to 1.18)
>56	0.292 (0.263 to 0.324)	1.00 (. to .)
Age of main household shopper		
18-34	0.201 (0.172 to 0.234)	0.85 (0.67 to 10.09)
35-49	0.253 (0.233 to 0.275)	1.16 (0.96 to 1.39)
50-64	0.265 (0.244 to 0.288)	1.23 (1.02 to 1.48)
65+ (reference category)	0.227 (0.198 to 0.259)	1.00 (. to .)
Social grade of household		
Medium-High and High	0.246 (0.221 to 0.274)	1.05 (.88 to 1.26)
Medium-Medium	0.237 (0.216 to 0.259)	1.00 (.84 to 1.18)
Medium-Low	0.224 (0.201 to 0.248)	0.93 (0.77 to 10.11)
Low (reference category)	0.237 (0.210 to 0.266)	1.00 (. to .)
Autonomous Community in which household located		
Community of Madrid	0.225 (0.201 to 0.251)	1.15 (0.80 to 1.65)
Basque Country	0.252 (0.206 to 0.303)	1.33 (0.88 to 2.03)
Navarre	0.217 (0.136 to 0.327)	1.10 (0.57 to 2.11)
Catalonia	0.200 (0.177 to 0.224)	0.99 (0.69 to 1.42)
Aragon	0.258 (0.199 to 0.329)	1.38 (0.86 to 2.22)
Balearic Islands	0.291 (0.216 to 0.379)	1.63 (0.97 to 2.73)
La Rioja	0.317 (0.203 to 0.458)	1.84 (0.92 to 3.65)
Castile and León	0.276 (0.237 to 0.318)	1.51 (1.03 to 2.23)
Cantabria	0.257 (0.174 to 0.363)	1.37 (0.75 to 2.49)
Galicia	0.212 (0.173 to 0.258)	1.07 (0.70 to 1.62)
Asturias	0.181 (0.133 to 0.242)	0.88 (0.53 to 1.44)
Valencian Community	0.237 (0.206 to 0.271)	1.23 (0.85 to 1.79)
Murcia	0.234 (0.180 to 0.298)	1.21 (0.76 to 1.93)
Canary Islands	0.213 (0.153 to 0.288)	1.07 (0.64 to 1.80)
Castilla-La Mancha	0.237 (0.192 to 0.289)	1.23 (0.81 to 1.88)
Andalusia	0.227 (0.204 to 0.252)	1.17 (0.82 to 1.67)
Extremadura (reference category)	0.201 (0.152 to 0.261)	1.00 (. to .)

Supplement Figure 3

Substitution ratio (the drop in volume of higher strength beer/the increase in volume of zero-alcohol beer) by days of follow-up since first new purchase of zero-alcohol beer. Data for 1719 newly purchasing households, hypothesis 1



Supplement Table 3

Sensitivity analysis, with different time intervals between first purchase of same-branded higher-strength beer and same-branded zero-alcohol beer. Coefficients (95% confidence intervals) for the changes in the dependent variables associated with the event for the interrupted time series analysis

	Interrupted time series analyses		
	Time interval		
	6 months	12 months	18 months
Branded zero-alcohol beer (ml)	140.43 (122.28 to 158.58)	147.66 (131.34 to 163.99)	147.60 (125.12 to 170.08)
Branded low-alcohol beer (ABV>0.0 and ≤3.5%) (ml)	Non-significant	-8.81 (-14.98 to -2.63)	Non-significant
Branded higher-strength beer (ABV>3.5%) (ml)	-23.66 (-38.72 to -8.60)	-73.31 (-90.39 to -56.22)	-113.26 (-134.58 to -91.93)
Grams of alcohol in all branded beers	-1.35 (-1.97 to -.73)	-3.48 (-4.57 to -2.39)	-4.68 (-5.50 to -3.87)
Grams of alcohol in all products	-4.54 (-8.27 to -.81)	-5.45 (-7.01 to -3.88)	-5.14 (-6.82 to -3.45)
Other non-branded beer (ABV>3.5%) (ml)	-15.75 (-27.97 to -3.53)	-24.67 (-37.97 to -11.38)	-23.53 (-39.48 to -7.59)
Wine (ABV>9.5%) (ml)	-1.36 (-2.45 to -.27)	-1.14 (-2.12 to -.15)	Non-significant
Spirits (ABV>35%) (ml)	Non-significant	Non-significant	Non-significant

Supplement Table 4

Coefficients (95% confidence intervals) for the changes in the dependent variables associated with the event for both the before- and after- analyses and the interrupted time series analysis, by gram group (groups of weekly purchases of alcohol (grams) prior to 1st purchase of zero-alcohol beer)

Dependent variables												
Gram Group	Zero-alcohol beer			Higher strength beer			Branded grams of alcohol			Grams of all alcohol		
	Before and after analyses		ITS	Before and after analyses		ITS	Before and after analyses		ITS	Before and after analyses		ITS
	Intercept	Event		Intercept	Event		Intercept	Event		Intercept	Event	
≤12	0.0	103.06 (95.46 to 110.66)	140.06 (111.73 to 168.40)	267.55 (253.16 to 281.94)	-62.47 (-82.89 to -42.05)	-62.53 (-85.36 to -39.70)	13.55 (12.97 to 14.14)	-3.84 (-4.66 to -3.01)	-3.84 (-4.72 to -2.95)	44.01 (42.67 to 45.35)	1.81 (-.09 to 3.72)	Ns
>12-≤25	0.0	74.98 (68.58 to 81.39)	124.18 (100.10 to 148.26)	437.33 (420.63 to 454.03)	-79.64 (-103.31 to -55.98)	-79.64 (-103.29 to -55.99)	19.52 (18.82 to 20.21)	-3.70 (-4.68 to -2.72)	-3.70 (-4.68 to -2.72)	65.26 (63.94 to 66.59)	-3.68 (-5.57 to -1.80)	Ns
>25-≤49	0.0	82.98 (77.14 to 88.83)	83.25 (78.42 to 88.08)	536.63 (519.39 to 553.88)	-45.50 (-69.89 to -21.10)	-45.50 (-69.88 to -21.11)	24.58 (23.90 to 25.26)	-3.87 (-4.83 to -2.91)	-3.87 (-4.83 to -2.91)	83.25 (81.99 to 84.50)	-5.64 (-7.42 to -3.87)	-5.64 (-7.42 to -3.87)
>49	0.0	100.84 (94.81 to 106.87)	141.12 (117.23 to 165.01)	884.74 (863.56 to 905.91)	-122.64 (-152.59 to -92.70)	-122.57 (-152.46 to -92.68)	37.12 (36.35 to 37.89)	-8.32 (-9.41 to -7.23)	-8.32 (-9.56 to -7.09)	136.46 (134.83 to 138.09)	-9.35 (-11.65 to -7.04)	-9.35 (-11.65 to -7.05)

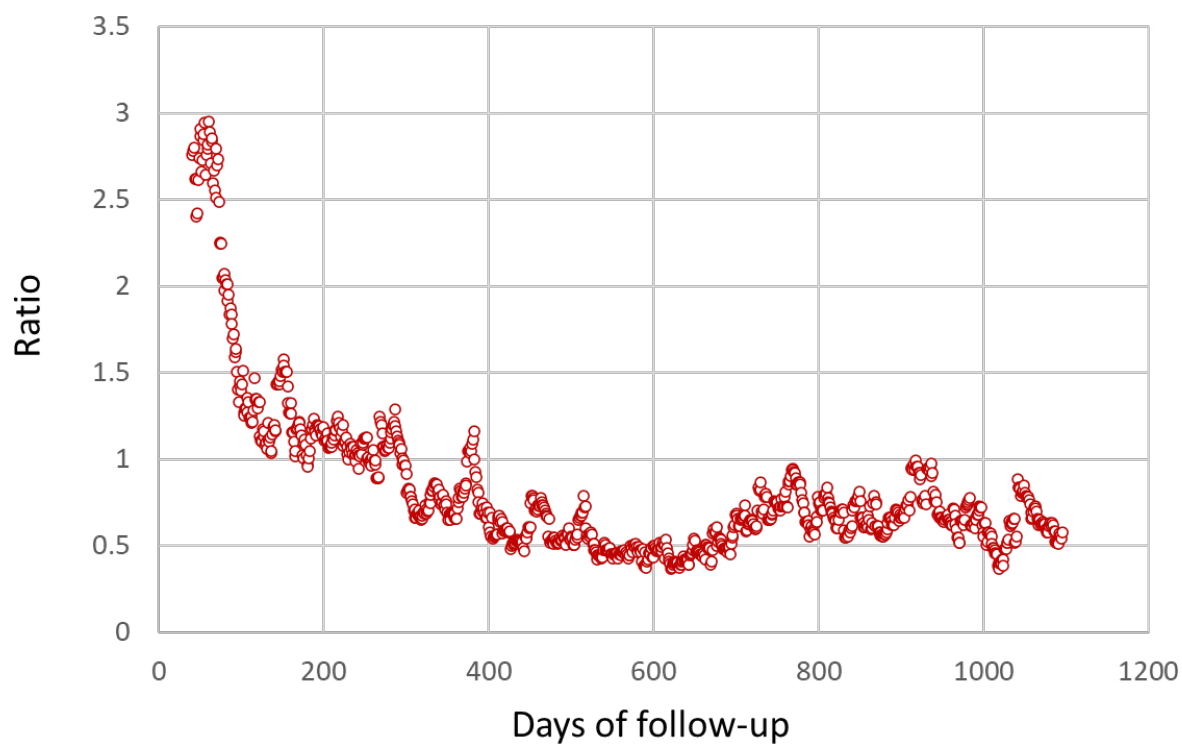
Supplement Table 5

Coefficients (95% confidence intervals) for the primary outcome variable (grams of alcohol) associated with the event for before- and after- interaction analyses between the event and the group of levels of alcohol consumption, grams per week: >49; >25-≤49; >12-≤25; ≤12 (reference category)

Intercept	44.01 (42.61 to 45.40)
>49	92.45 (90.48 to 94.43)
>25-≤49	39.24 (37.27 to 41.21)
>12-≤25	21.26 (19.28 to 23.23)
≤12 (reference category)	.00 (. to .)
Event	1.81 (-.17 to 3.80)
>49*event	-11.16 (-13.96 to -8.37)
>25-≤49*event	-7.46 (-10.25 to -4.66)
>12-≤25*event	-5.50 (-8.29 to -2.70)
≤12*event (reference category)	.00 (. to .)

Supplement Figure 4

Mean ratio of the volume of purchases of zero-alcohol beer/higher strength beer by days of follow-up since first new purchase of zero-alcohol beer. Data for 337 households that had never previously purchased a same-branded higher strength beer (-ve/+ve households), hypothesis 2



ORIGINAL

Minors and drug-facilitated sexual assaults: Between submission and chemical vulnerability

Menores y agresiones sexuales facilitadas por drogas: Entre la sumisión y la vulnerabilidad química

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Abstract

Drug-facilitated sexual assault (DFSA) is a topic of growing social concern in recent years. Despite this, few empirical studies carried out in Spain have analysed the phenomenon from a preventive approach. The aim of this study, in addition to providing new evidence on DFSA, specifically in minors, was to identify possible associated variables, thus contributing to a better understanding of the problem and to the design of more effective prevention policies. To this end, a survey was carried out among minors in the autonomous community of Galicia. A total of 7,181 students aged 12 to 17 ($M = 14.79$; $SD = 1.57$) participated. Data collection was carried out by means of a self-administered questionnaire on paper. Data concerning DFSA were collected by means of specific items, piloted beforehand. Screening instruments for problem drug use (AUDIT, CAST, CRAFFT and EUPI-a) were also used. The results allow us to estimate the rate of victimisation by DFSA in Galician minors at 1.7%, of which only 11.4% would have reported it. Beyond the socio-demographic profile of the victims (females in 2 out of 3 cases), they present different patterns with regard to the pattern of problematic consumption of alcohol and other substances and the pattern of problematic use of the Internet and social networks, with a significantly higher prevalence of online risk behaviours. This suggests that this phenomenon goes far beyond sexual violence, so it is necessary to address it at a preventive level from a comprehensive perspective, including educational and public health perspectives.

Keywords: DFSA, chemical submission, chemical vulnerability, adolescents, sexual assaults

Resumen

Las agresiones sexuales facilitadas por drogas (DFSA) constituyen un tópico que viene suscitando una creciente preocupación social en los últimos años. Pese a ello, son pocos los trabajos empíricos llevados a cabo en España que hayan analizado el fenómeno desde un enfoque preventivo. El objetivo de este trabajo, además de aportar nueva evidencia respecto a las DFSA, concretamente en el ámbito de los menores, ha sido identificar posibles variables asociadas, contribuyendo así a comprender mejor el problema y a diseñar políticas de prevención más eficaces. Para ello se realizó una encuesta entre menores de la comunidad autónoma gallega. Participaron 7.181 estudiantes de 12 a 17 años ($M = 14,79$; $DT = 1,57$). La recogida de datos se realizó mediante un cuestionario autoadministrado en papel. Los datos referentes a las DFSA fueron recogidos mediante ítems específicos, pilotados previamente. Se utilizaron también instrumentos para el cribado de consumos problemáticos (AUDIT, CAST, CRAFFT y EUPI-a). Los resultados permiten estimar la tasa de victimización por DFSA en menores gallegos en un 1,7%, de los que únicamente habrían denunciado el 11,4%. Más allá del perfil sociodemográfico de las víctimas (mujeres en 2 de cada 3 casos), éstas presentan patrones diferenciados respecto al patrón de consumo problemático de alcohol y otras sustancias y al patrón de uso problemático de Internet y redes sociales, con una prevalencia significativamente mayor de conductas de riesgo *online*. Ello sugiere que este fenómeno va mucho más allá de la violencia sexual, por lo que es preciso abordarlo a nivel preventivo desde una perspectiva integral, incluyendo la perspectiva educativa y de salud pública.

Palabras clave: DFSA, sumisión química, vulnerabilidad química, adolescentes, agresiones sexuales

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Drug-Facilitated Sexual Assault (DFSA) is an issue which has raised growing social concern in recent years (Ministerio de Justicia, 2022). While this justifies the need for empirical data to quantify and characterize the problem, it is rather difficult to estimate the real figures and, consequently, to be able to assess its true magnitude. This is due mainly to two factors. Firstly, the existing conceptual or terminological confusion results in a lack of precision when defining and differentiating possible cases. While the terms “chemical submission” (CS), “chemical vulnerability” (CV), and “drug-facilitated sexual assault” (DFSA) are often used interchangeably, there are important nuances that should be taken into account. Chemical submission consists of the subjugation of a person’s will, or the modification of their behaviour, through the surreptitious administration of a psychoactive substance in order to commit a crime (López-Rivadulla et al., 2005). Although it may occur for the purpose of committing any type of crime (assault, robbery...), it is mostly linked to crimes of a sexual nature. In these cases, the English acronym DFSA (“Drug-Facilitated Sexual Assault”) is recommended as this refers to sexual assaults committed when the victim is under the influence of some substance. Traditionally, two types of DFSA have been found: premeditated or proactive DFSA, in which the assailant surreptitiously administers an incapacitating substance to the victim in order to subdue them sexually (thus, CS), and opportunistic DFSA, where the victim voluntarily consumes the substance before being assaulted (García-Repetto & Soria, 2011). In the latter case, instead of chemical submission (CS), it would be more correct to speak of chemical vulnerability (CV) (Burillo-Putze, López-Hernández, Expósito-Rodríguez & Dueñas-Laita, 2013). Using each of these terms appropriately is essential, given the implications it has at the epidemiological and prevention level.

Secondly, there is a scarcity of empirical studies in Spain that have focused on estimating the real prevalence of DFSA. Although much of the published research agrees that DFSA could account for around 20-30% of sexual assaults (McGregor et al., 2004; Panyella-Carbó, Agustina & Martín-Fumadó, 2019; Quintela-Jorge, Cruz-Landeira & García-Caballero, 2014; Xifró-Collsamata et al., 2015), most of these studies have been carried out in clinical or forensic settings (Anderson et al., 2017; Cruz-Landeira, Quintela-Jorge & López-Rivadulla, 2008; García-Repetto & Soria, 2014; Hindmarch, ElSohly, Gambles & Salamone, 2001; Hurley, Parker & Wells, 2006; Navarro-Escayola & Vega-Vega, 2013; Panyella-Carbó et al., 2019; Quintela-Jorge et al., 2014; Xifró-Collsamata et al., 2015). Therefore, they only include victims who reported the assault and/or requested medical care. Taking into account the low rates of complaints and consultations of which some studies warn (Barreiro et al., 2020), this could imply an underestimation

of the size of the problem. Moreover, less is known when the youngest age groups are involved since, although some authors have warned of the high incidence of cases among minors (McGregor et al., 2004), little evidence has been provided in this regard. In the exploratory study by Barreiro et al. (2020), the percentage of young people/adolescents between 14 and 24 years of age who may have been victims of DFSA is estimated at 2.9%.

Beyond these two major limitations, it is also important to underline the paucity of empirical work carried out from a preventive perspective, aimed at identifying the variables that may lie at the root of all these issues. Much of the research has focused on analysing, directly or indirectly, the role that alcohol and substance use may play as one of the major risk factors for sexual assaults (Altell, Martí & Missé 2015; Anderson et al., 2017; Caamano-Isorna, Adkins, Moure-Rodríguez, Conley & Dick, 2021; Graham, Bernards, Abbey, Dumas & Wells, 2014; Hughes, Anderson, Morleo & Bellis, 2008). As early as 2008, the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) published a monograph in which it warned that the problem was becoming a growing trend, linking it specifically to the growing patterns of binge drinking and the use of new psychoactive substances (Olszewski, 2009). Although the idea has spread in recent years that certain drugs such as scopolamine (more commonly known as “burundanga”) are behind a many of the DFSA cases, scientific evidence points to alcohol, ahead of cannabis and benzodiazepines, as the main substance involved in this type of aggression (Isorna & Rial, 2015; Isorna, Souto, Rial, Alías & McCartan, 2017). Research carried out in Spain found the alcohol detection rate in victims to be over 45% (García-Repetto & Soria, 2014; Panyella-Carbó et al., 2019; Quintela-Jorge et al., 2014; Rodríguez-Pérez, 2020; Xifró-Collsamata et al., 2015), a level in line with results of studies in other countries, such as the United Kingdom (Scott-Ham & Burton, 2005), Canada (Du Mont et al., 2010), USA (Hagan & Reidy, 2015; Hindmarch et al., 2001; Juhascik et al., 2007), Australia (Hurley et al., 2006) and South Africa (Tiemensma & Davies, 2018). Likewise, drug detection rates were between 20 and 40%, with benzodiazepines the most frequently found substance (García-Repetto & Soria, 2014; Panyella-Carbó et al., 2019; Quintela-Jorge et al., 2014; Rodríguez-Pérez, 2020). Other substances such as cannabis, cocaine or amphetamines were detected in similar percentages in Spain (Panyella-Carbó et al., 2019; Quintela-Jorge et al., 2014; Rodríguez-Pérez, 2020; Xifró-Collsamata et al., 2015), also coinciding with some British, Canadian and American studies (Du Mont et al., 2010; ElSohly & Salamone, 1999; Scott-Ham & Burton, 2005).

In sum, the different studies coincide in pointing out that DFSAs constitute a truly complex phenomenon, and one not only associated with substance use. Some authors

suggest that it is necessary to approach the problem from a broader perspective, including a wider range of variables (Lorenz & Ullman, 2016; Neilson et al., 2018) and involving the use of pornography, affective sexual education, or the use of social networks (Ballester, Rosón & Facal, 2020; Rodríguez-Castro, Martínez-Román, Alonso-Ruido, Adá-Lameiras & Carrera-Fernández, 2021).

For all the above reasons, the present exploratory empirical study is designed to meet the general objective of contributing to a better understanding of the phenomenon of DFSA in adolescence. We intend, on the one hand, to provide new data on the magnitude of the problem and, on the other, to try to identify possible associated variables, especially in relation to both the use of alcohol and other substances, as well as Internet and social network use. More specifically, it is intended: (1) to report the rates of DFSA found in minors in the autonomous community of Galicia; (2) to estimate the percentage of cases reported and those that remain unreported, or in which medical care is not even requested; (3) to attempt a characterisation of the victim's profile, not only from the sociodemographic perspective, but also from substance use habits and Internet and social network use, as well as contextual variables such as habitual participation in binge drinking sessions. All this not only has the aim of contributing to quantifying, describing and characterising the problem, but also to better understand it and, consequently, to guide new prevention policies. Lastly, while at an empirical level this study does not set itself the specific objective of delimiting which DFSA cases may be defined as chemical submission and which aspects as chemical vulnerability, we hope that all the information collected will contribute to a development of the discussion in this regard.

Method

Participants

To meet the proposed objective, a selective methodology was employed consisting of a survey administered in paper format among secondary students from schools in the four provinces of Galicia. Sample selection was carried out by intentional sampling, with a total of 47 schools (38 state and 9 private/state supported [*concertado*]) agreeing to take part. Participants had to be underage students between 12 and 17 years of age. Exclusion criteria were refusal to participate and the presence in the questionnaires of a high percentage of missing values or an inconsistent response pattern. The initial sample consisted of 7,339 adolescents, although 158 were eliminated for not meeting the inclusion criteria or presenting some exclusion criteria. The final sample comprised 7,181 students, aged between 12 and 17 years ($M = 14.79$; $SD = 1.57$). Participants in compulsory secondary education (ESO) made up 71.9% of the sample, and 28.1% were in the higher secondary school level, the

baccalaureate (BAC). In terms of age groups, 23.9% were aged 12-13 years, 38.1% 14-15, and the remaining 38% 16-17. Those indicating "female" when asked about their gender comprised 50.8%, while 48% chose the "male" and 1.2% the "other gender" options, respectively.

Instruments

Data collection was carried out using a paper-based self-administered questionnaire divided into four sections. The first collected information on sociodemographic variables such as age, gender or course and on different aspects linked to Internet and social network use. The second section contained a small scale made up of six items related to DFSA, used in the exploratory study of Barreiro et al. (2020) with an acceptable internal consistency ($\alpha = .79$) and a funnel structure (Item 1: "*Has anyone ever invited you to drink alcohol or use other drugs in an attempt to flirt with you?*", Item 2: "*Has anyone ever given you alcohol or other drugs to try to take sexual advantage of you?*", Item 3: "*Have you ever woken up disoriented and with the suspicion that you might have been drugged?*", Item 4: "*Has anyone ever taken sexual advantage of you after giving you alcohol or other drugs?*", Item 5: "*If so, did you go to emergency or any medical service?*" and Item 6: "*Did you report it?*"). All items had a dichotomous response format (0 = No, 1 = Yes). The third block contained questions referring to substance use habits in the last year (alcohol, tobacco, cannabis, drunkenness, use of hookahs, participation in binge drinking sessions [*botellones*], etc.), and the fourth included three specific scales for screening problematic consumption: the *Alcohol Use Disorders Identification Test* (AUDIT), the *Cannabis Abuse Screening Test* (CAST), and the *Abuse Screening Test* (CRAFT). The *Problematic Internet Use Scale for Adolescents* (EUPI-a) was also included.

AUDIT was developed by the World Health Organization (WHO) as a screening instrument for problematic alcohol use (Saunders, Aasland, Amundsen & Grant, 1993; Saunders, Aasland, Babor, De La Fuente & Grant, 1993). It consists of ten Likert-type items assessing the amount and frequency of drinking (items 1-3), possible symptoms of dependence (items 4-6) and problems related to alcohol use (items 7-10). The global score can range from 0 to 40. A cut-off point of 4 was used, as in the validation study by Rial, Golpe, Braña & Varela (2017). The internal consistency obtained was very high ($\alpha = .93$).

CAST is a tool developed in France as part of the ESCAPAD survey (Beck, Legleye & Observatoire français des drogues et des toxicomanies, 2003). It consists of six Likert-type items with five response options ("Never" [0], "Rarely" [1], "Sometimes" [2], "Quite often" [3] and "Very often" [4]). Two correction options are included in the literature: CAST-f (*Full*), in which the score for each item ranges from 0 to 4 and the final score from 0 to 24; and CAST-b (*Binary*), in which each item scores 0 or 1 and the final score oscillates between 0 and 6. Our study used the

full version with a cut-off point of 4, following the recent validation with Spanish adolescents by Rial et al. (2022). The internal consistency obtained was high ($\alpha = .86$).

CRAFFT was developed by the Center for Adolescents Substance Abuse Research (CeASAR) (Knight et al., 1999) as a tool for early detection of risky use of alcohol and other substances in adolescents. It is made up of three filter items and six items that constitute the CRAFFT itself. Following the recommendations of the validation study carried out with Spanish adolescents by Rial et al. (2018), a cut-off score of 2 was applied. Internal consistency was similar to that obtained in the original study ($\alpha = .77$).

Finally, the EUPI-a scale was developed by Rial, Gómez, Isorna, Araujo and Varela in 2015 as a screening instrument for problematic internet use (PIU) in Spanish adolescents. It consists of 11 items with Likert-type responses with five response options (from “Never” [0] to “Always” [4]). The final score ranges from 0 to 44, and a score greater than 16 is considered to indicate PIU (Rial et al., 2015). Internal consistency was also high ($\alpha = .88$).

Procedure

Data collection took place throughout the 2020/2021 academic year in the classrooms of the schools themselves, in small groups and by researchers with experience in this type of task. A pilot test was carried out with a sample of 50 subjects from the same population under study in order to estimate the time needed to complete the questionnaire, to check the questions were understood correctly, and to anticipating possible doubts or difficulties in data collection. The time taken to complete the questionnaire ranged from 20 to 25 minutes, and there were no doubts or difficulties. The participants were previously informed of the purpose of the study. Participation was voluntary and unpaid, and the anonymity and confidentiality of responses was guaranteed at all times. The study had the consent and approval of the school managements and the respective parent associations. Parents were sent an informative letter expressly indicating the possibility of rejecting participation in the study, for the purpose which their children had to provide a letter signed by one of their parents. The study protocol was approved by the Bioethics Committee of the University of Santiago de Compostela (code: USC-035/2021).

Data analysis

Before the analysis itself, data filtering was carried out to check for the presence of inconsistent response patterns and missing data. Missing values analysis was done following the appropriate guidelines (Rial, Rojas & Varela, 2001), and it was verified that non-response did not exceed 10% in any of the questionnaire variables and, at the same time, the distribution of the missing cases followed a random distribution. To detect possible inconsistencies, contingency

tables were created between the related variables, although no contradictory cases were detected.

First, a descriptive analysis was carried out by calculating frequencies and percentages, as well as central tendency and dispersion statistics. This was followed by a bivariate tabulation, with chi square (χ^2) tests of independence and the calculation of Cramer's V as an estimator of the possible effect size. The analyses were carried out with the statistical package IBM SPSS Statistics 25 (IBM SPSS Statistics for Windows, 2017).

Results

Table 1 shows the rates of DFSA, with 22.8% of minors reporting having been invited on some occasion to drink alcohol or use other drugs with the intention of “flirting”, while 4.2% were given some substance to try so that they could be “taken advantage of”, 2% woke up at some point feeling disoriented and suspecting they may have been drugged and, finally, 1.7% stated that they had been taken advantage of at some point after having been given alcohol or other drugs. It should also be noted that, of these, only 19.7% went to a medical centre and 11.4% reported it.

The segmental analysis shows that, in general, the percentages were higher among female participants than male participants, except in the case of item 3 (“*Have you ever woken up disoriented and with the suspicion that you might have been drugged?*”), where the differences were not significant. These results show that girls tended to suffer this problem significantly more than boys (1.9% vs. 1.2%), but that they reported it much less (5.3% vs. 18.4%).

Regarding differences by age group, the percentages of affirmative responses for items 1, 2 and 4 (“*Has anyone ever invited you to drink alcohol or use other drugs in an attempt to flirt with you?*”, “*Has anyone ever given you alcohol or other drugs to try to take sexual advantage of you?*” and “*Has anyone ever taken sexual advantage of you after giving you alcohol or other drugs?*”) were significantly higher in the older age groups. This indicates that it is a problem that increases with age (the victimization rate rises from 0.2% in the 12-13 age group to 2.6% in the 16-17 age group), but that it is rarely reported, regardless of the victim's age. In any case, the fact that for items 3, 5 and 6 (“*Has anyone ever woken up disoriented and with the suspicion that you might have been drugged?*”, “*If so, did you go to emergency or any medical service?*”, and “*Did you report it?*”) the differences are not significant suggests that this type of interpretation should be made with caution.

Data were also analysed from the perspective of the “victim's” sociodemographic profile, for which the 119 cases responding affirmatively to item 4 were selected. Figure 1 shows that 62.5% of the “victims” were identified as female and 37.5% as male. Although 59.7% belonged to the 16-17 age group, 41.3% had not yet reached the age of 16.

Table 1
DFSA rates (global and by segments)

	Global (%)	Female (%)	Male (%)	χ^2	V	12-13 years (%)	14-15 years (%)	16-17 years (%)	χ^2	V
Has anyone ever invited you to drink alcohol or use other drugs in an attempt to flirt with you?	22.8	28.6	16.8	138.88***	.14	8.6	20.7	33.9	424.23***	.23
Has anyone ever given you alcohol or other drugs to try to take sexual advantage of you?	4.2	5.7	2.5	43.62***	.079	1.2	3.9	6.4	79.91***	.10
Have you ever woken up disoriented and with the suspicion that you might have been drugged?	2.0	2.4	1.5	1.06	---	1.9	2.2	2.2	0.10	---
Has anyone ever taken sexual advantage of you after giving you alcohol or other drugs?	1.7	1.9	1.2	5.18*	.028	0.2	1.6	2.6	50.36***	.07
<i>If yes,</i>										
Did you go to emergency or any medical service?	19.7	11.8	30.6	5.61*	.23	25.0	22.0	17.6	0.52	---
Did you report it?	11.4	5.3	18.4	4.17*	.21	12.5	16.0	8.1	1.83	---

Note. (*) $p < .05$; (**) $p < .01$; (***) $p < .001$.

Regarding substance use in the previous year, Table 2 shows that DFSA “victims” ($n = 119$) presented percentages of use 3-4 times higher than “non-victims” ($n = 7,062$) with the differences in all cases being especially noticeable in the case of drunkenness (66.4% vs. 18%), smoking (58.8% vs. 16.2%) or the use of purple drank (28.6% vs. 4.5%). The rates of problematic use detected by AUDIT, CAST or CRAFFT screening were also 3-4 times higher. In terms of profile, it could be said that almost 70% of DFSA victims presented a pattern of problematic drinking, and 1 in 4

of problematic cannabis use (28.4%). Furthermore, 80% reported having taken part in binge drinking sessions in the last year and 2 out of 3 admitted to having got drunk. Smoking hookah tobacco was reported by 57.6%, with 35.3% using cannabis, 70.6% alcohol with energy drinks and 28.6% purple drank.

At the same time, however, differences were not found only in the sociodemographic profile and in the patterns of alcohol and other substance use, since significant differences could also be seen regarding Internet and

Figure 1
Sociodemographic victim profile

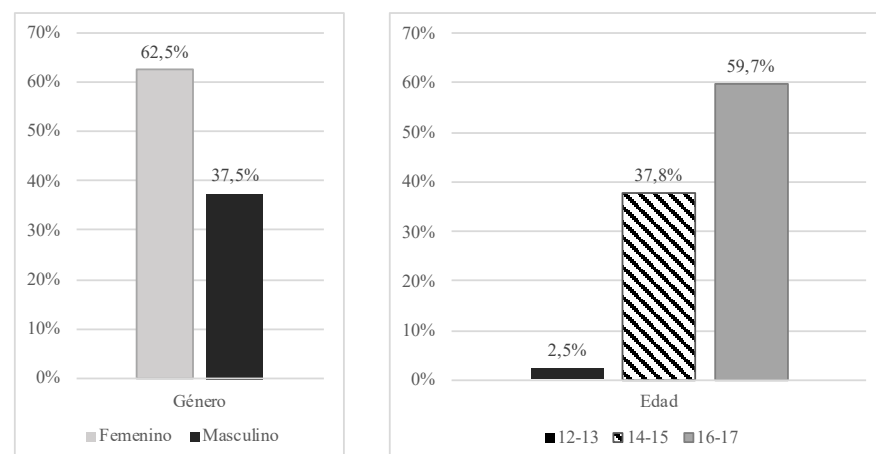


Table 2

Comparison of substance use in the previous year between DFSA victims (n = 119) and non-victims (n = 7062)

	Non-victims (%)	Victims (%)	χ^2	V
Alcohol	37	78	82.73***	.11
Drunkenness	18	66.4	175.72***	.16
Binge drinking	30	81	137.11***	.14
Tobacco	16.2	58.8	148.96***	.15
Cannabis	9.2	37.8	105.95***	.12
Tobacco hookah	17.3	57.6	125.01***	.13
Cannabis hookah	7.2	35.3	125.73***	.13
Purple drank	4.5	28.6	142.07***	.14
Alcohol with energy drinks	30.6	70.6	85.42***	.11
AUDIT +	22	69.7	149.20***	.15
CAST +	4.9	28.4	100.41**	.13
CRAFFT +	18.7	64.7	155.01***	.15

Note. (***) $p < .001$.

Table 3

Comparison of technological habits between DFSA victims (n = 119) and non-victims (n = 7062)

	Non-victims (%)	Victims (%)	χ^2	V
<i>Have you ever...</i>				
visited websites with erotic or pornographic content?	31	58.3	31.43***	.07
contacted strangers through the Internet, chats, social networks or video games?	28.3	48.3	21.74***	.06
accepted someone you didn't know at all on social media?	41.6	66.4	28.41***	.06
met in person with people you got to know exclusively through the Internet, chat rooms, social networks or video games?	12.3	37	62.39***	.09
been pressured by someone, or have they tried to blackmail you into sending them erotic or sexual photos or videos of you?	5.7	26.9	88.69***	.11
been blackmailed by someone who published, shared or forwarded photos or videos of you/or erotic or sexual content?	0.9	10.9	106.31***	.13
been sent photos or videos by your contacts of themselves/or of erotic or sexual content?	15.9	54.6	124.91***	.133
sent photos or videos of yourself/or erotic or sexual content?	6.3	28.6	88.71***	.11
EUPI-a +	26.2	46.2	23.04***	.06

Note. (***) $p < .001$.

social network use. Table 3 shows how “victims” reported significantly higher percentages of online risk behaviours and a PIU rate almost double that of “non-victims” (46.2% vs. 26.2 %). The percentage of “victims” acknowledging that they physically met people they initially got to know exclusively through the Internet (37%) is particularly striking, being three times higher than in the case of “non-victims” (12.3%). The same can be said for sending personal photos or videos and erotic or sexual content (active sexting), which was four times higher (28.6% vs. 6.3%), as well as passive sexting (three times higher: 54.6%

vs. 15.9%), or blackmail suffered by sharing or publishing personal photos or videos of an erotic or sexual nature (up to 12 times higher: 10.9% vs. 0.9%). The victim subsample (n = 119) was also analysed for possible gender differences, with significant differences found only with regard to binge drinking ($\chi^2 = 3.86$; $p < .05$) where a higher percentage of females was confirmed (88.2% vs. 71.4%).

Finally, although the observed effect sizes (Cramer's V values) were indeed small, a binary logistic regression analysis was performed for exploratory purposes. Item 4 (“Has anyone ever taken sexual advantage of you after giving you

alcohol or other drugs?”) was used as the dependent variable, while the different variables referring to both substance use and Internet and social network use, along with gender and age were taken as independent variables. Although the model was statistically significant ($\chi^2 = 200.64$; $p < .001$), the results obtained showed little explanatory power ($R^2_{\text{Nagelkerke}} = .23$), with the variable presenting a greater weight being drunkenness ($\beta = 1.25$), binge drinking ($\beta = 1.18$) and the fact of having previously been the object of Internet blackmail ($\beta = 1.13$).

Discussion

The present study was intended to provide evidence that would help not only to quantify the problem of drug-facilitated sexual assault, but also to better understand it and guide efforts at prevention. The results obtained allow us to draw five major conclusions. First of all, almost two out of every hundred minors in the autonomous community of Galicia may have been victims of DFSA, which means that we are talking about more than 2,000 cases. Secondly, although it is a type of crime mostly suffered by adolescents aged 16-17 years, it is possible to detect cases in individuals as young as 12-13 years. Thirdly, although in two out of three cases the victims identified as female, it is not limited exclusively to them. This represents a novelty compared to earlier studies, for example the research by Navarro-Escayola and Vega-Vega (2013) or Panyella-Cabó et al. (2019), which found a female-male ratio of 20 to 1. Fourthly, it is important to highlight the fact that only one in ten cases was reported and eight out of ten victims did not even go to a medical centre. Finally, it was possible to verify that DFSA victims presented a differential profile as far as substance and Internet use are concerned. The fact that the victims showed three-to-four times higher rates of alcohol and cannabis use or binge drinking, as well as “positives” on the AUDIT, CAST or CRAFFT screenings will revive the existing controversy surrounding chemical submission versus chemical vulnerability. The fact that the victims also presented a pattern of vulnerability regarding Internet and social network use, with three times as many online risk practices, means that in preventive terms we must go one step further when addressing the problem.

Regarding the possible implications of these results, several lines of discussion may be established. One of them is the need for the public administration itself to dispose of regular information systems to facilitate good assessment and monitoring of the problem. Official sources such as police and judiciary statistics may be underestimating the problem, which justifies the preparation of ad hoc victimisation surveys, equipped with the required methodology and rigor. Meanwhile, the fact that only two out of ten victims went to a medical centre and only one out of ten reported the assault suggests the need to make a greater effort at the level

of social awareness and a more in-depth analysis to identify possible underlying barriers or resistance. Fear, feelings of shame or guilt, lack of social support or even the fact that in some of these situations it can be shown that the victim had voluntarily ingested large amounts of alcohol or substances can act as a barrier to reporting the facts.

Another issue that deserves special consideration is that female DFSA victims reported the assault between three and four times less than male victims, despite having a higher victimisation rate. This could be due to the normalisation of sexual harassment and “low intensity” abuse that women appear to have historically assumed in nightlife contexts, which would make them more tolerant of this type of behaviour (Altell et al., 2015). These and other issues justify the need to approach the problem from a gender perspective, the analysis of which should also incorporate sexual orientation, which could help explain the high rate of victimisation found among males. In this regard, some studies warn that young people belonging to the LGBTBIQ+ community would be at greater risk of victimisation than cisgender heterosexuals (Coulter et al., 2017; Coulter & Rankin, 2020; Tilley, Kolodetsky, Cottrell & Tilton, 2020).

Regarding the fact that cases of DFSA have been reported in the 12-13 age group, while not disturbing, it would be unsurprising if one takes into account the levels of consumption already detected at those ages (García-Couceiro et al., 2020; Rial et al., 2019). As previous studies have noted, adolescents who start consuming earlier are more likely to be involved in potentially dangerous practices (Rial, Golpe, Barreiro, Gómez & Isorna, 2020). For this reason, substance use onset age must be studied as a possible risk factor in DFSA victimisation. The fact that the victims show a repertoire of problematic consumption coincides with what the literature indicates (Caamano-Isorna et al., 2021; Dir, Riley, Cyders & Smith, 2018; Gilmore, Lewis & George, 2015), but rather than criminalising the victims, it must be taken into account when defining a vulnerability profile and, consequently, when designing prevention policies. It would be important to analyse DFSA from a public health perspective since it seems rather difficult to make progress in solving the problem without progress in the prevention of alcohol and other drug use in adolescence. In this regard, experts insist on the relevance of adopting early detection and intervention models, such as the SBIRT model (*Screening, Brief Intervention and Referral to Treatment*) (García-Couceiro et al., 2021), which involves a proactive attitude within a comprehensive and community-based public health system when addressing the problem.

Meanwhile, the fact that the differences between “victims” and “non-victims” also extended to other areas, such as ways of interacting through the Internet and with the Internet, is of great interest. The results show the existence of a particular interaction pattern featuring more

online risk behaviours, a higher rate of PIU, and greater online exposure of DFSA victims, especially in everything related to the sexual area (higher rates of active and passive sexting, use of pornography, contact with strangers, pressure, blackmail and attempted sextortion). This association, already noted in studies by Conley et al. (2017), Dir et al. (2018) or Yépez-Tito, Ferragut & Blanca (2021), does not seem in any way spurious or random, so it must be taken into account at the level of prevention. Consequently, in addition to the public health point of view, an educational perspective must be incorporated into prevention which includes both the affective-sexual level as well as responsible Internet use.

Finally, some limitations of this study should be noted. Despite the relatively large sample (over 7,000 minors), the fact that a probabilistic sampling strategy was not used prevents the results being interpreted from an epidemiological perspective; therefore, the figures offered should not be considered in terms of prevalence, but as estimates. Likewise, the study's methodological design means that the relationships found between the variables cannot be interpreted in terms of causality. Only a longitudinal design would allow a causal relationship to be established and antecedents or prognostic factors to be distinguished from consequent factors. On the other hand, a more in-depth reflection reveals the need to incorporate certain variables in future research which would allow a richer analysis and understanding of the problem; these would range from variables such as socioeconomic level, sexual orientation, substance use onset age, or the age of the first sexual relationships, to variables of a clinical nature, such as the presence of anxiety-depressive disorders or post-traumatic stress disorder due to previous experiences of victimisation, as well as of a psychological nature (e.g. personality traits, self-esteem or assertiveness). It should also not be ignored that this study focuses on the profile of the victim and does not address that of the aggressor, which constitutes another limitation. Finally, it should be noted that all variables were self-reported, so responses may depend on the subjectivity of the adolescents themselves, who may have under- or overestimated their behaviours. However, as different experts have pointed out, self-report measures have proven to be equally reliable as other methods when assessing levels of substance use as well as different associated risk behaviours (Babor, Kranzler & Lauerma, 1989; Winters, Stinchfield, Henly & Schwartz, 1990).

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Conflict of interests

The authors of this article declare no conflict of interest.

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ORIGINAL

Anchor heuristics effect on heavy drinking in young people: Behavior economics perspective

El efecto de la heurística de anclaje sobre el consumo excesivo de alcohol en los jóvenes: Una perspectiva desde la economía conductual

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Abstract

There is a need for theory-based approaches to reduce heavy drinking in youths. Anchoring is a process in which people make estimates by starting from an initial value that is adjusted to yield a final answer. In this study, we determined the effectiveness of anchoring heuristics in estimating the price of a bottle of alcohol and its effect on heavy drinking in young people. In a sample of 327 young people in Mexico, participants completed a survey on alcohol drinking and anchoring heuristics. We found that when the anchor was shown and the participants were explicitly directed to the anchor value, the mean estimates of the price reported by the participants increased, indicating that the participants were pulled up toward the anchor. Anchoring effects were found to affect on the willingness of the alcohol consumers to pay. In this context, alcohol prices (anchor condition) were higher for heavy drinking. We discuss the implications of our results and future directions for research on anchoring effects in heavy drinking. We concluded that anchoring provides novel insights into the consequences of anchoring effects in alcohol drinking.

Keywords: anchoring heuristics, behavior economics, prices, heavy drinking

Resumen

Son necesarios enfoques basados en la teoría para reducir el consumo excesivo de alcohol en los jóvenes. El anclaje es un proceso en el que las personas hacen estimaciones a partir de un valor inicial que se ajusta para dar una respuesta final. En este estudio, determinamos la efectividad de las heurísticas de anclaje en la estimación del precio de una botella de alcohol y su efecto sobre el consumo excesivo de alcohol en los jóvenes. En una muestra de 327 jóvenes en México, los participantes completaron una encuesta sobre el consumo de alcohol y las heurísticas de anclaje. Encontramos que cuando se mostró el ancla y a los participantes se les dirigió de forma explícita hacia el valor del ancla, aumentaron las estimaciones medias del precio informado por los participantes, lo que indica que ellos eran atraídos hacia el ancla. Descubrimos que los efectos de anclaje afectaron la disposición a pagar (DAP) de los consumidores de alcohol. En este contexto, los precios del alcohol (condición ancla) eran más altos para el consumo excesivo de alcohol. Discutimos las implicaciones de nuestros resultados y las direcciones futuras para la investigación sobre los efectos de anclaje en el consumo excesivo de alcohol. Llegamos a la conclusión de que el anclaje proporciona nuevos conocimientos sobre las consecuencias de los efectos de anclaje en el consumo de alcohol.

Palabras clave: heurística de anclajes, economía conductual, precios, consumo excesivo de alcohol

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Alcohol consumption represents a risk factor for the development of psychological, social, and health problems (Cruz-Soto, Palacios, Lopez & Villagomez, 2019; Palacios, 2018; Reséndiz et al., 2018). Behavior economics emphasizes how individuals make decisions based on heuristics and bias (Aston & Cassidy, 2019; Kahneman, 2003). Anchoring is a type of heuristic that leads people to adjust their (numerical) judgments based on previous pieces of external information known as anchors. Therefore, anchoring occurs when, in the course of the decision process, a person uses a reference value (an anchor) to choose a given course of action (Tversky & Kahneman, 1974).

There is preliminary evidence on several factors that influence the expression of anchoring (Ariely, Loewenstein & Prelec, 2003; Berthet, Autissier & de Gardelle, 2022; Furnham & Boo, 2011; Jung, Perfecto & Nelson, 2016; Lynch & Ariely, 2000). Research suggested that responses exist that may reflect the tendency to respond in a normative manner based on an initially presented value parameter (Kahneman & Tversky, 1996; Gigerenzer, 1991). Early explanations of anchoring heuristics suggest that anchor values serve as the reference point for people to adjust their response to the range of plausible values (Epley & Gilovich, 2001; Epley & Gilovich, 2010). Based on this concept, several researchers found changes in the prices of consumer goods (Brzozowicz & Krawczyk, 2022; Green, Jacowitz, Kahneman & McFadden, 1998; Shan, Diao & Wu, 2020). These studies demonstrated that consumers will tend to change their payments in line with anchoring.

Regarding the use of anchoring in alcohol consumption, the results revealed by Epley and Gilovich (2006) indicated that university students who were sober provided estimates further from their anchor values than participants who had been drinking in the last 12 hours. However, there is scarce work in this area of research that considers the fact that heavy alcohol use may be affected by heuristics, specifically considering anchoring effects. Therefore, we asked the following questions: Can anchoring effects reduce binge drinking? Based on behavioral economics regarding alcohol (MacKillop & Murphy, 2007; MacKillop et al., 2009; MacKillop et al., 2014), can the estimated price of a bottle of alcohol be modified? Further, as a result of this modification, can these modifications decrease alcohol consumption in young people? Using the answers to these questions, one can create a context based on external cues to establish a price that serves as a reference for young people to make decisions about their alcohol consumption.

Given how often young people choose the price of alcoholic beverages, anchoring could be important across many contexts of consumption, specifically in the purchase of bottles of alcohol (Byrnes, Shakeshaft, Petrie & Doran, 2013; Morrell, Reed & Martinetti, 2021; Murphy, Correia

& Barnett, 2007); therefore, alcohol price and heuristics are two possible candidates for the explanation of anchoring effects.

Behavioral economic theory assumes that alcohol-demand-related increases in price are associated with decreased consumption (Bickel, Green & Vuchinich, 1995). Previous studies found that an increase in the price of alcoholic beverages reduces the quantity, frequency, and intensity of alcohol consumption (Heckley, Jarl & Gerdtham, 2017) across various types of beverages and all types of drinkers, ranging from light to heavy (Ayyagari, Deb, Fletcher, Gallo & Sindelar, 2013; Shrestha, 2015; Wagenaar, Salois & Komro, 2009); however, there is insufficient evidence regarding how anchoring may contribute to explaining binge drinking.

The purpose of the current research was to determine the effectiveness of the anchoring heuristic in estimating the price of a bottle of alcohol and its effect on heavy drinking in young people. We hypothesized that youths who were anchored in their price would increase the amount they were willing to pay for the price of a bottle more often the next time they decided to buy a bottle of alcohol. We further hypothesized that if heuristic anchoring modifies the price drinkers were willing to pay for a bottle of alcohol, it was likely to estimate the price of a bottle of alcohol, changing the magnitude of these effects regarding binge drinking. We expected that higher bottle prices might be associated with greater heavy alcohol consumption, resulting in the reinforcement of drinking.

Method

Study Design

A cross-sectional design was used to verify behavioral changes, considering that estimates of alcohol prices would be affected by heuristic anchors.

Participants

To calculate the sample size, an average of 1200 complete surveys were considered from people aged 18 to 60 years as the population. A 50% prevalence of alcohol consumption was estimated (Palacios, 2019), as well as a 95% confidence interval and a 5% margin of error, resulting in a sample of 291 participants. For this study, the sample consisted of 327 young people (57.8% female and 42.2% male, with an age range between 16 and 35 years [$M = 20.99$, $SD = 2.7$]) selected using a random, non-probabilistic sample. The sample was predominantly from Chiapas State in Mexico. The participants reported having at least a bachelor's degree. Of the participants, 63% studied, 6.4% worked, and 30.3% studied and worked.

Measures

Alcohol Consumption

Drinking was measured using questions on the age of onset of alcohol consumption, frequency of alcohol use in the last month (from *never* to *daily*), quantity of alcohol consumed per event (number of drinks consumed per occasion), incidence of heavy alcohol drinking (5 or more glasses per event) (from *never* to *daily*), and number of drinks they think they need to get drunk (number of drink glasses per event) using the Alcohol Questionnaire (Palacios, 2019). The measurement was adapted to the Mexican sociocultural context (Palacios, 2021; Palacios & González, 2020).

Alcohol Purchase Questionnaire (APQ)

A questionnaire was adapted for this study from the version used by other authors (Bickel et al., 1995; Mackillop et al., 2009). We asked the participants to estimate the number of standard drinks they would purchase and consume. We administered a brief 3-item questionnaire that was designed to assess alcohol demand: (1) *price* was measured with an indication of the money participants would pay for a bottle of alcohol; (2) *intensity*, which represents the maximum spent and consumed (intensity of demand), was measured with the interaction between the money spent and the quantity of alcohol consumed; and (3) *persistence* was measured using the sensitivity to increasing the price up to drunkenness.

Anchoring Heuristics

We adapted the task used by Jacowitz and Kahneman (1995) to measure the price of a bottle of alcohol and its susceptibility to anchoring. With the use of an open-question format, participants were first asked about the amount of money they were willing to pay for a bottle of alcohol.

After completing the alcohol drinking questionnaire, participants were presented with a hypothetical anchoring task involving the price of a bottle. In this task, participants were shown the following instructions: “A new limited-edition bottle of alcohol from your favorite brand just came out for \$25 USD (\$21 EUR; \$500 Mexican pesos).” This initial activity served as the “anchor.” Immediately, all participants were then asked to estimate the exact price they would pay for it (i.e., their willingness to pay (WTP)). Participants were also asked to mention how willing they would be to buy it using a Likert scale format (between 1—*nothing willing* and 4—*very willing*).

Procedure

The information was obtained over a month. The instrument was applied to the participants digitally through a form developed in Google Forms and was shared through social networks, with an approximate response time of 20 minutes. The purpose of the study was explained on the

form, and the participants were asked to answer honestly, as their responses would be used for research.

Ethical Considerations

All participants were informed about what the project consisted of (previously approved by the University Ethics Committee, with the registration number PCSUVM-012021). It was made clear to them that their participation was voluntary, that the information was anonymous, and that the confidentiality of the data provided was guaranteed. Participants provided electronic consent and then completed the survey. The research protocol was established in accordance with the regulations of the General Health Law, specifically its section on research with human beings (Secretaría de Salud, 2011).

Data Analysis

Data analyses were performed by considering the descriptive statistics for alcohol drinking. For descriptive analyses of the anchoring effects, we used an anchoring index (AI) proposed by Jacowitz and Kahneman (1995) to measure the movement of the median estimate of anchored subjects toward the anchor to which they were exposed. The anchoring index score was calculated as follows: (median estimate [high anchor] – median estimate [low anchor]) / (high anchor – low anchor). In the anchoring index, the plausible values range from 0 (no anchoring effect) to 1 (the median estimates of anchored subjects coincide with the anchors shown). In the present research, the low and high anchors were, respectively, at the 15th and 85th percentiles of estimates for the alcohol bottle price.

To examine the impact of anchoring heuristics on alcohol price consumption, we used a related *t-test* to compare the change in the price of a bottle of alcohol after introducing the anchor. Finally, a one-way ANOVA was conducted to test the statistical significance of the price of the bottle after the anchor was introduced between the different levels of heavy alcohol drinkers. Throughout all analyses, $p \leq 0.05$ was interpreted as statistically significant. Effect sizes were reported using Cohen's *d* and eta square (η^2).

Results

The results showed that 64.8% of youths drank alcohol. The participants started drinking at 16.75 ($SD = 2.4$) years of age. Moreover, 41% had a frequency of drinking of once a month or less, 27.2% drank just once per month, 10.4% drank every fifteen days, 3.3% drank three or four times a month, 1.5% drank two or three times a week, and 16.5% had never drunk. The percentage of participants who reported heavy alcohol consumption within the last month, which was defined as five glasses or more in a single instance, was 31.2%. The range of the number of drinks consumed varied between 1 and 50 ($M = 5.38$, $Md = 4.0$,

Table 1
Differences in anchoring price (in MXN) by willingness to pay

Willingness	<i>M</i>	<i>Md</i>	<i>SD</i>
Nothing willing	253.33	250.00	126.5
Few willing	308.78	300.00	133.7
Moderately willing	492.66	136.17	500.0
Very willing	642.86	500.00	276.5

Note. *M*—mean, *Md*—median, *SD*—standard deviation.

SD = 5.8). In addition, participants reported the mean number of standard drinks they considered necessary to get drunk was 8.6 (*Md* = 6.0, *SD* = 8.9). The participants reported a mean drink bottle price of \$312 MXN (*Md* = \$250 MXN, *SD* = \$225 MXN; USD 14.92, EUR 13.47). The relationship between the amount of money they spent per week and the amount of money they spent when buying an alcohol bottle was analyzed and no significant relationship was found ($r = 0.086$, $p = 0.21$).

We calculated the anchoring effect using the difference between the price they pay for a bottle of alcohol (*M* = \$322.37 MXN, *Md* = \$250 MXN, *SD* = \$225.4 MXN) and the estimate of the price they would pay after shown the anchor. The mean anchoring effect (*M* = \$354.73 MXN, *Md* = \$300 MXN, *SD* = \$176.9 MXN) was higher than the price they pay for a bottle. There was a significant difference between the price shown with the anchor and the price that the participants estimated after the presence of the anchor ($t_{(206)} = -2.28$, $p < 0.05$), indicating that participants' estimates were pulled up toward the anchor (Cohen's $d = 0.44$). Another measure of the size of the effect was the correlation between the price they paid and the subjects' price estimates after seeing the anchor. The correlation obtained was $r = 0.50$, $p < 0.001$.

We conducted an ANOVA to compare the mean anchor price between the categories and the participants' willingness to pay. There was a significant difference in the anchor price ($F_{(3, 246)} = 51.04$, $p < 0.001$, $\eta^2 = 0.38$), indicating that participants who were very willing to pay the price of the bottle shown (anchor) estimated a higher

Table 2
Differences in alcohol price (in MXN) by drinking level

Drinking Level	<i>M</i>	<i>Md</i>	<i>SD</i>
Never	300.47	300	233.9
Only once	304.24	300	185.8
Once a month or less	355.11	300	148.9
Every fifteen days	331.82	300	118.8
Three or four times a month	425.00	350	175.1
Two or three times a week	500.00	500	0.00
Daily or almost daily	500.00	500	0.00

Note. *M*—mean, *Md*—median, *SD*—standard deviation.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

price to pay for it (Table 1). The results clearly showed that the anchor price led to a substantial difference in their responses based on their willingness to pay for the alcohol consumers in our sample. These effects were demonstrated by the high price difference between the willingness-to-pay conditions and the predominance of the large effect sizes for the anchor. Additional comparisons were performed to analyze the money spent per week between the two WTP cases. The results did not show significant differences in weekly spending ($F_{(3, 246)} = 0.29$, $p = 0.82$) between the WTP cases.

For the anchoring index (AI), the data revealed a value of 0.77, i.e., the anchoring score was higher than the normative value of 0. The median was \$500 MXN for the high anchor and \$190 MXN for the low anchor. The percentiles provided clues regarding the effectiveness of the anchors. Some participants may be pulled toward low anchor values or would otherwise be pulled up toward high values. The results showed that 11.3% of the participants were located below the low anchor (15th percentile) and 21.1% were located above the high anchor (85th percentile).

We used an analysis of variance (ANOVA) to test the anchoring effect on heavy drinkers (Table 2). The ANOVA results revealed that heavy drinking had a significant effect on anchoring ($F_{(6, 244)} = 2.18$, $p < 0.05$, $\eta^2 = 0.05$), indicating that the estimated price per bottle of alcohol (anchor condition) was higher for the heavy drinkers than

Table 3
Alcohol behavior comparison by anchor level

	High <i>N</i> = 62		Low <i>N</i> = 32		<i>t</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Price (MXN)	502.97	272.7	145.79	94.5	-8.83***
Quantity	7.21	7.9	3.12	2.7	-2.80**
Binge drinking	9.88	7.8	5.65	5.8	-2.68**

Note. *M*—mean, *SD*—standard deviation.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

participants who engaged in low alcohol consumption. To verify that the results were due to anchoring and not because heavy drinkers had more money and were therefore willing to spend more money on alcohol, we conducted further analyses. The results showed that not differences were found in the total money spent per week and the excessive consumption of the participants ($F_{(6, 244)} = 1.01, p = 0.41$).

Finally, we aimed to specifically verify the effects of the low and high anchors on alcohol-drinking behavior. The *t*-test results presented in Table 3 indicate significant differences in price, quantity, and binge drinking. Therefore, the high and low anchors altered the estimation of the alcohol price (Cohen's $d = 1.46$), and high anchors produced a greater effect on alcohol drinkers (Cohen's $d = 0.61$) and binge drinkers (Cohen's $d = 0.58$).

Discussion

This study contributed to verifying the association of alcohol price with binge drinking and understanding the anchoring heuristic in estimating the price of a bottle of alcohol and its effect on heavy alcohol drinking.

We examined the hypothesis that anchoring has effects on modifying the price of a bottle of alcohol and changing the magnitude of these effects in binge drinking. In this study, our results demonstrated that anchoring effects occurred with the estimate of the price participants would pay after being shown the anchor. This study provided the first evidence that an increase in the price of a bottle of alcohol could increase their estimation of its price after presenting the anchoring heuristic and its effect on heavy drinking in young people. Our data confirmed the proposed hypothesis, which maintained that price heuristic anchoring affected the price that the participants were willing to pay for a bottle of alcohol. In particular, we provided evidence regarding the difference between the alcohol price shown with the anchor and the price that the participants estimated after the presence of the anchor. Previous research (Epley & Gilovich, 2001; Gigerenzer, 1991; Jacowitz & Kahneman, 1995; Tversky & Kahneman, 1974) established that when an anchor contains not only a number but also semantic information consistent with a target (e.g., the hypothetical price of an alcoholic drink), the anchor value is highly compatible with the target value, and this affects the numerical estimation of the target. In addition, we identified the contributions to the effectiveness of anchor heuristics and the conditions under which it facilitated behavior change, with a medium effect size supporting the effectiveness of the anchor heuristic.

In our research, we analyzed the WTP the alcohol anchor price. These results confirmed that the participants who were willing to pay the price of the bottle (anchor) estimated a higher price to pay for it. Therefore, the anchored price was contingent on their willingness to pay,

and this estimate may have also been affected by anchoring (Brzozowicz & Krawczyk, 2022; Green et al., 1998; Shan et al., 2020).

In the present study, we provided evidence of the anchor effect in alcohol pricing. The data showed that people adjusted their initial estimate to meet the anchor estimate, demonstrating that there were anchoring effects produced by the anchored price in the anchoring index. Our empirical results supported the effects of a high and low anchor (Jacowitz & Kahneman, 1995). We showed that the percentage above the high anchor was greater than the percentage below the low anchor. In addition, the median price reported by the participants located in the high percentile was similar to the price of the anchor. These results showed that the price shown as an anchor influenced the participants who were pulled up toward high values in the alcohol price estimation task, which was consistent with previous research (Berthet et al., 2022; Epley & Gilovich, 2001; Jacowitz & Kahneman, 1995; Jung et al., 2016).

We compared the anchoring effect on heavy drinkers. Our data revealed that heavy drinking had a significant effect on anchoring. Consistent with previous research (Epley & Gilovich, 2006), individuals with heavy drinking adjusted their price estimate with the values of the displayed anchor. The results showed a growing adjustment in the estimated price to buy a bottle of alcohol (anchor condition), where there was an increase in heavy drinking. Finally, in terms of behavioral economics, the number of alcohol drinkers was higher above the high anchor in comparison with below the low anchor. Prominent alcohol consumption was sensitive to increases in the response cost expressed in the price, which started very low and escalated to very high levels in heavy drinkers. These findings contribute toward empirically identifying the underlying effect of alcohol anchor prices on the differential increase in heavy drinking in young people. Such findings are in line with several previous studies (Berthet et al., 2022; Brzozowicz & Krawczyk, 2022; Epley & Gilovich, 2006; Jacowitz & Kahneman, 1995; Tversky & Kahneman, 1974) on anchoring heuristics.

Although these results are promising, the present study had several limitations. First, our sample was not representative of the entire country, and thus, further research should be conducted on more representative samples. Second, the type of currency in each country may affect the price of alcoholic beverages and, consequently, lead to an increase or decrease in their consumption. Third, our research did not incorporate an analysis by sex. In future research, we must consider an analysis by sex regarding alcohol consumption and the anchoring heuristic. Fourth, generally, anchoring experiments use two groups: one group with a low anchor condition and one group with a high anchor condition. We only used one group divided by low and high conditions. Further

research should be conducted with two groups (low and high conditions) to test the robustness of the results. Finally, a replication of this result is needed in other samples to confirm its effect. This is an important and necessary step before beginning to establish predictive associations with other variables of interest.

Research on behavior economics and alcohol anchoring has important preventive implications. Based on the results, strategies could be implemented in individual preventive actions. We propose that an intervention strategy based on behavioral economics incorporating anchoring heuristics can be used to reduce alcohol consumption in young people. The design of these interventions must consider young people as a target group based on the consumption levels of the participants.

Among the strengths of this research, this was the first study with these characteristics that was carried out in Mexico and Latin America on anchoring heuristics and their effect on heavy drinking in young people. Future research can help to determine the application of the anchoring heuristic in binge drinking. We will seek to understand the value of the reinforcer (immediate or delayed) involved in the evaluation of binge drinking. Understanding strategies by which individuals approach decisions about alcohol consumption has relevant implications. It is important to recall that the tendency to respond impulsively is associated with problematic behaviors. In addition, to continue from the present study, affective states and prefrontal cortex functions will be incorporated as antecedents involved in anchoring.

Conclusions

Consistent with a behavioral economics approach (Bickel et al., 1995; Kahneman, 2003; MacKillop et al., 2014), this study represented the first research in Mexico and Latin America on anchoring heuristics regarding estimating the price of a bottle of alcohol on heavy drinking in Mexican young people. Researchers interested in the potential effects of anchoring heuristics and their implications will find that this study shows the presence of consistent anchoring effects produced by an anchored price in the *anchoring index* and that the anchor's price impact increased when the level of anchoring increased. In particular, individuals with high levels of alcohol drinking were more sensitive to anchor cues and were more willing to pay for the bottle when the anchor was shown.

Conflict of interests

The authors have no competing interests to declare

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AUTHOR GUIDELINES

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- 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.

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