

# Adicciones

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

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# Addictions and COVID-19, the pandemic impact

## *Adicciones y COVID-19, impacto de la pandemia*

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As was to be expected, the impact of the SARS-CoV2 pandemic and the months-long lockdown it caused brought about changes in the patterns of addictive psychoactive substance use, in other non-substance addictive behaviours and in the population's mental health (García-Álvarez, Fuente-Tomás, Sáiz, García-Portilla & Bobes, 2020). Since then, numerous studies have been conducted in an attempt to determine the consequences of these changes for the physical and mental health of the population, both general and clinical. This editorial presents the main findings and lessons of this abundant research.

In March 2020, the WHO declared the outbreak of SARS-CoV2, which causes the COVID-19 disease, a global pandemic. Governments enforced isolation rules and restrictions on the movement of the population to limit the rise of cases and the associated morbidity and mortality. Spain was one of the worst affected countries and the one that imposed the tightest restrictions in Europe. These restrictions affected the entire population, but the most vulnerable, such as patients with substance use disorders (SUD) or mental health problems, were affected in a way that has not yet been fully understood (Marel, Mills & Teesson, 2021).

The mental health consequences of individuals exposed to the pandemic and its consequences are manifold and can result in adverse psychological responses such as anxiety, major depression or depressive episodes, post-traumatic

stress disorder, self-harm behaviour or suicide (Dubey et al., 2020; Marel et al., 2021; Shanahan et al., 2019). Studies conducted during the pandemic in the most affected countries have shown high rates of symptoms linked to moderate-severe anxiety, fear of contagion and disorders linked to trauma and depression (Marel et al., 2021; Shanahan et al., 2019). These psychiatric symptoms have been associated with risk factors such as female sex, feelings of loneliness and financial instability, among others (Marel et al., 2021; Shanahan et al., 2019).

Such factors are also likely to affect other risk behaviours and generate changes in the consumption of alcohol and other addictive psychoactive substances (Clay & Parker, 2020). It has been shown that an increase in the level of stress and anxiety increases the motivation to use psychoactive substances as a coping mechanism; in this case, it is clear that the global pandemic was a highly stressful event (Marel et al., 2021; Shanahan et al., 2019). It has been argued that the increase in fear and concern regarding the rise of COVID-19 infections would generate an increase in consumption and in the age of onset, while others have suggested that trafficking of illicit drugs, and thus their sale and purchase, would be seriously disrupted during lockdown, thereby leading to a significant reduction in the use of such drugs and with it an increase in withdrawal syndromes (Cisneros & Cunningham, 2021; Dubey et al., 2020; Kumar et al., 2022; Mallet, Dubertret & Le Strat, 2021). It is also understood that COVID-19 disrupts the treatment of

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patients suffering from substance use disorder and thus increases relapse potential (Blithikioti, Nuno, Paniello, Gual & Miquel, 2021; Tracy, Wachtel & Friedman, 2021).

### Substance use disorders, mental disorders and COVID-19 illness

SUD patients are particularly susceptible to the effects of the pandemic as they are at higher risk of suffering the serious consequences of COVID-19 infection (Cisneros & Cunningham, 2021; Dorjee, Kim, Bonomo & Dolma, 2020; Dubey et al., 2020; Kumar et al., 2022; Mallet et al., 2021). The following factors make SUD patients more vulnerable to higher morbidity and mortality (Dorjee et al., 2020) in relation to COVID-19 infection (Dubey et al., 2020):

- Presence of cardiopulmonary diseases.
- Metabolic disorders and obesity.
- Weakened immunity.
- Malnutrition.
- Liver diseases.
- Drug-induced cardiorespiratory depression.
- Alcohol and tobacco use increase the production of the enzyme ACE 2 (angiotensin-converting enzyme type 2), which is a target of SARS-CoV2.
- Difficulties in socio-health integration that delay help seeking.

Furthermore, COVID-19 infection has been described as impacting kynurenine, a product of the tryptophan metabolism pathway, whose functionality is closely related to inflammatory processes, and whose main activity in the central nervous system is to regulate the glutamergic, dopaminergic and serotonergic systems involved in SUD and psychiatric problems (Attademo & Bernardini, 2021; Cisneros & Cunningham, 2021). This could imply an increased direct risk of greater loss of control in patients with SUD and a heightened risk of exacerbating their psychiatric comorbidity. In addition, SARS-CoV2 has been shown to be capable of invading neuronal tissue, which could involve an alteration in cerebral homeostasis and, in turn, a risk of relapse in patients with SUD (Cisneros & Cunningham, 2021).

The comorbidity of SUD and mental disorders among substance users is very high. A cross-sectional survey of a cohort of 1,266 patients in a study conducted in the health services of Madrid, Barcelona and Seville found that a mental disorder was diagnosed in 43% of the sample. The most frequent diagnoses were depression (37.5%) and specific phobia (6.8%) (Herrero, Domingo-Salvany, Brugal & Torrens, 2011). Another example is the COPSIAD study in the addiction treatment network of Galicia. This cross-sectional study with 2,300 outpatient participants found that 56.3% had psychiatric comorbidity, with depressive and anxiety disorders again being the most prevalent (Pereiro, Pino, Flórez, Arrojo & Becoña, 2013).

These studies demonstrate the high prevalence of psychiatric comorbidity among patients with SUD, which therefore puts these patients at higher risk of worsening comorbid mental disorders when infected and suffering from COVID-19 (Marel et al., 2021) given the physical and psychological stress caused by infection and lockdown. The following factors may be crucial in generating stress and worsening mental health with an increase in hopelessness and suicidal ideation (Marel et al., 2021):

- Isolation and loss of social cohesion.
- Loneliness.
- Loss of employment and financial difficulties.
- Increase in domestic violence.
- Reduction in the availability of social and health resources.

### Changes in consumption during lockdown

From the earliest days of the pandemic caused by SARS-CoV2, there was a certain concern regarding possible increases in the use of alcohol and other addictive psychoactive substances. However, evidence gathered in studies conducted during previous pandemics suggests that such substance use can change in two directions: it may increase in the population suffering emotional or psychological distress, or it may decrease due to restrictions on movement and the accompanying economic crisis (Lapeyre-Mestre et al., 2020). While representing a reality that we have already imagined, the numerous studies carried out to date also provide additional information that may be considered interesting for the future. In the following, the results obtained for the different substances of abuse, and for non-substance addictive behaviours are outlined.

#### Alcohol

Focusing on the studies which have been conducted in the countries suffering most strongly from the impact of the pandemic (United States, Canada, Italy, Spain, Russia, France and the United Kingdom), and comparing moments of lockdown with the same period of the year before the pandemic, results show that drink-related problems worsened during lockdown, with increased statistics of high-risk drinking (Llorens, Brime & Molina, 2021). A study with data from hospitals in Italy showed that, in contrast with a notable decrease in total visits to emergency departments, the absolute number of emergency admissions involving alcohol poisoning rose strongly compared to the same time period in 2019. This statistic rose still further after restrictions on movement were lifted (Grigoletto et al., 2020). In addition, there was an increase in the number of emergency admission with alcohol withdrawal symptoms (Grigoletto et al., 2020).

Studies carried out across lockdown in Spain and in other countries indicate a reduction in drinking overall, including the total cases of alcohol poisoning. This fall in

consumption was more significant in those aged under 25 years (Avena, Simkus, Lewandowski, Gold & Potenza, 2021; Clay & Parker, 2020; Imtiaz et al., 2021; Kyaw Hla et al., 2021; Llorens et al., 2021; Roberts et al., 2021; Vanderbruggen et al., 2020).

The paradoxical results obtained in the studies, with a drop in global alcohol use on the one hand and a rise in the problems caused by drinking on the other, can be understood thus: more extreme phenomena (more abstinence yet also more acute alcohol poisoning), as well as the temporary break in specialized services for patients with both consumption patterns, trigger more hospital emergency treatments at the individual level for drink-related problems (both withdrawal syndromes and acute alcohol poisoning), despite surveys showing an overall decrease in alcohol use. That is to say that the change lies above all in the way individuals use alcohol depending on their level of vulnerability; in total, less alcohol was drunk during lockdown for different reasons (accompaniment at home, movement restrictions, problems in accessing alcohol) but some vulnerable people experienced an extreme increase or decrease (increased use due to feelings of loneliness, social helplessness, difficulties at work, coping etc., or decreased use because of continuous accompaniment at home, lack of options to obtain alcohol, etc.), resulting in a large number of vulnerable patients requiring urgent medical attention (Grigoletto et al., 2020; Llorens et al., 2021).

Risk factors for increased alcohol use during COVID-19 include:

- Loneliness.
- Male gender.
- Advanced age.
- Having children.
- High educational level.
- Loss of purchasing power or unemployment.
- Poor physical health.
- Impulsiveness.
- Isolation.
- Mental disorders: Mental health factors were the most common triggers for increased alcohol use. The mental disorder most strongly involved in the increase in drinking was depression (Blithikioti et al., 2021).

Conversely, the factors associated with a reduction in alcohol use are:

- Religion.
- A high level of social support.
- Being a student: The low alcohol consumption of students is easily understood considering that their drinking takes place at specific moments and can be extreme, with high rates of social drinking. The closure of university campuses limited the sale of alcohol and many students went home with their parents, which is linked to lower alcohol use compared to those who remained on campus (Lundahl & Cannoy, 2021).

### ***Other non-alcoholic addictive psychoactive substances***

Studies indicate that the following substances were used less during lockdown: alcohol, nicotinic agents, cannabis, opiates and cocaine (Avena et al., 2021; Clay & Parker, 2020; Imtiaz et al., 2021; Llorens et al., 2021; Roberts et al., 2021; Vanderbruggen et al., 2020); the only reported increase was in the use of over-the-counter sedative-hypnotics. These are benzodiazepine agents that can cause tolerance, withdrawal and addiction. The data reflected in the studies indicate that this increase in the use of sedative-hypnotics occurred mainly in the population aged between 25 and 54 years, and in women. Consumption rose from 1.9% to 3.1% in less than a year (Avena et al., 2021; Clay & Parker, 2020; Imtiaz et al., 2021; Llorens et al., 2021; Roberts et al., 2021; Vanderbruggen et al., 2020). On the other hand, the number of deaths related to overdosing on these substances rose as the vulnerable addicted population responded to pandemic-induced stress by increasing their consumption, while the capacity for social and health care of specialized treatment services was reduced (Imtiaz et al., 2021; Tracy et al., 2021).

Data indicate that these sedative agents were not any less accessible during lockdown, thereby enabling a rise in consumption as a method of self-medication against the stress that the pandemic generated at its peak (Llorens et al., 2021). However, for the other substances, consumption decreased since lockdown and curfews made them more difficult to obtain. All this evidence demonstrates something that we already knew: consumption falls in the general population if accessibility to substances is severely affected, but stress generated by the social scenario of reduced accessibility raises consumption in vulnerable people and in addicts with mental disorders and social difficulties.

### ***Gambling for money online and offline***

Unsurprisingly, offline gambling was considerably reduced during lockdown, while online gambling maintained its prevalence rates, mainly involving the young male population, the group that most uses this gambling method (Hodgins & Stevens, 2021; Llorens et al., 2021). Not surprisingly, the prevalence of problem online gamblers grew, with accessibility again determining the results observed with respect to gambling.

### ***Internet and social network use and abuse in adolescents during lockdown***

The use and abuse of the internet, social networks and mobile phones continues to increase beyond the existence of worldwide social-health problems such as a pandemic; the latter merely acted as a natural catalyst to accelerate a process that had already been underway throughout the last decade (Gjoneska et al., 2022; Marciano, Ostroumova, Schulz & Camerini, 2021).

Digital tools served to facilitate the new normality of living with restrictions and requiring changes in essential habits. The most important, according to the studies conducted, occurred in education, in teleworking, in the incorporation of technologies in the fields of health, in entertainment and in electronic commerce. Although these are the digital fields that were most affected by the pandemic and lockdown, it was social networks and their abusive use that attracted the most negative consequences for the mental health of today's adolescents and young adults (Gjoneska et al., 2022; Marciano et al., 2021).

From the first minute of the pandemic, we were told of the need for social distancing, reinforced by home lockdown. The youngest were forced to carry out a large part of their daily, academic and social life online and this led to a greater use of social networks on their part (Gjoneska et al., 2022; Marciano et al., 2021).

In this way, social networks took on the function of that fundamental space in which a young person forms, creates and moulds their relationships, profiles their identity, and expresses themselves and gets to know the world "around them".

The highest incidence of social media use occurred among young people aged between 16 and 24 years, a very important and crucial moment for the emotional and psychosocial development of human beings. The consequences of increased use of these networks, with a strong impact on the mental health of our young people, were anxiety and depression (Sampasa-Kanyinga & Lewis, 2015). Studies show that four out of five young people reported that the use of social networks caused them anxiety or made it worse (Sampasa-Kanyinga & Lewis, 2015; Shannon, Bush, Villeneuve, Hellemans & Guimond, 2022).

Regarding sleep, 1 in 3 students said they woke in the middle of the night and checked their mobile phones and social networks, worsening the quality of their sleep, with the subsequent problems of daytime sleepiness and difficulties in attention, concentration and memory leading to poorer academic performance (Shannon et al., 2022).

Anxiety and insomnia are joined by distortion of body image and eating behaviour disorders. The internet is a framework in which ideal lifestyles are promoted, as well as extreme physical characteristics already well known in the world of fashion, but this time in the hands of our young people, who tend to compare, copy and even compete (Fardouly, Diedrichs, Vartanian & Halliwell, 2015). The strong impact caused by certain social networks such as *Instagram* or *Tik Tok*, where adolescents compete and copy each other to lose weight quickly and share their progress on the networks so that others can see their achievements (Al-Hazzaa et al., 2022).

There is also concern that internet and social network use increases the loneliness and hopelessness of the youngest, exacerbating the risk of self-harm and suicidal behaviour (Khatcherian, Zullino, De Leo & Achab, 2022).

## Conclusions

These are the key conclusions that we can draw from the main studies linking addictions to COVID-19:

1. The reduction in the use of certain substances such as alcohol, nicotinic derivatives, cocaine, opiates or cannabis during lockdown can be explained by the fact that a large percentage of the consuming population is young, and during lockdown these young people had to return to their parents' home and leave their places of study, thereby decreasing the use of these substances given their reduced accessibility. This reduction in accessibility not only affected the youngest but also, although less intensely, the older adult population (Llorens et al., 2021).
2. The reduction in health care in addiction treatment services meant that a clinical population already isolated and with frequent psychiatric comorbidities, which used substances as a way of coping with their loneliness and pandemic-induced fears, was left unattended for some time. It is this most vulnerable population that increased substance use, resulting in a polarized scenario. Thus, while global consumption fell, a smaller percentage of the population increased consumption as they were more vulnerable to stress and used addictive psychoactive substances as their main coping strategy. If we add to this that addiction involves a loss of control over consumption, it is easy to understand why polarization occurred (Kyaw Hla et al., 2021). This polarization caused an increase in emergency health care due both to withdrawal syndromes and severe poisoning from severe substance abuse as a form of coping (Grigoletto et al., 2020).
3. Patients with SUD are more vulnerable to COVID-19 due to the direct and indirect mechanisms already mentioned (Attademo & Bernardini, 2021; Dorjee et al., 2020). For this reason, they require closer supervision by the health services, but this supervision was curtailed during the pandemic as isolation measures restricted the capacity of specialized units, an essential link between such patients and the health system, to monitor and treat these most vulnerable patients (Bli-thikioti et al., 2021; Tracy et al., 2021).
4. The increase in internet and social network use that lockdown engendered in young people and adolescents is of particular concern. While the effect that these technologies have on the mental health of the most vulnerable adolescents and young people was already recognised, we now also know that this vulnerability increased during lockdown by causing isolation and hopelessness in the youngest (Gjoneska et al., 2022; Khatcherian et al., 2022; Marciano et al., 2021; Shannon et al., 2022).



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# Trends in psychiatric hospitalization for alcohol and drugs in Castilla y León between 2005 and 2015

## *Tendencias en la hospitalización psiquiátrica por alcohol y drogas en Castilla y León entre 2005 y 2015*

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### Abstract

It has been estimated that alcohol, tobacco, and illicit drugs were responsible for more than 10 million deaths worldwide in 2016, and there are many opportunities for improvement. Regarding innovative data analysis, advances have been made in the extraction of information from administrative databases for analytics purposes. We studied trends in hospitalization rates for alcohol and drug abuse over eleven years with Joinpoint Trend Analysis software. This is a descriptive study of cross-associations in 3,758 hospital admissions of patients admitted with a main diagnosis of alcohol and drug abuse or dependence in psychiatry units of public health centres of Castilla y León (Spain) between 2005 and 2015. Hospitalization trends for alcohol and drug related conditions declined over the eleven-year period. Separately, there was a statistically significant decrease in alcohol and cocaine related conditions, but a strong upward trend in cannabis related conditions between 2013 and 2015. Alcohol was the main cause of admission to psychiatric units with a diagnosis of addiction. In the 11 years researched, there was a progressive and constant reduction in admissions for substance use except for cannabis. The innovative statistical methodology has already proven to be useful for identifying trends and changes in different pathologies over time.

**Keywords:** Psychiatry; substance-related disorders; hospitalization; diagnosis-related groups; health information systems.

### Resumen

A nivel mundial, se ha estimado que el alcohol, el tabaco y las drogas han sido responsables de más de 10 millones de muertes en 2016, y que existe mucho margen para reducir la mortalidad. Se han realizado avances en la extracción de información de bases de datos administrativas con el fin de analizar grandes volúmenes de datos sanitarios. Hemos estudiado las tendencias en las tasas de hospitalización con diagnóstico de adicción a alcohol y drogas durante once años con el software Joinpoint Trend Analysis. Se trata de un estudio descriptivo de asociación cruzada de 3.758 ingresos hospitalarios de pacientes con diagnóstico principal de abuso o dependencia de alcohol y drogas en unidades de Psiquiatría de centros públicos de Castilla y León entre 2005 y 2015. Las tendencias en la hospitalización por adicción al alcohol y/o drogas disminuyeron a lo largo de los once años. Además de una reducción estadísticamente significativa de los ingresos por alcohol y cocaína, se apreció una fuerte tendencia al alza en los ingresos por cannabis entre 2013 y 2015. El alcohol fue durante todo el periodo de estudio la principal causa de ingreso y el que más días de hospitalización ha generado. No obstante, en los 11 años se observó una reducción progresiva y constante en los ingresos por todas las sustancias a excepción del cannabis. La metodología utilizada ya ha demostrado ser muy útil para identificar cambios de tendencias en diferentes patologías.

**Palabras clave:** Psiquiatría; trastorno por uso de sustancias; hospitalización; grupos relacionados por el diagnóstico; sistemas de información médicas.

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The period 1990 to 2016 saw a considerable worldwide increase in the number of people with disorders caused by alcohol and drug use, driven by population growth and aging (GBD 2016 Alcohol and Drug Use Collaborators, 2018). There is evolutionary and biological evidence that humans are predisposed to consume alcohol, illicit drugs, and nicotine (Anderson, Gual & Rehm, 2018). The use of tobacco, alcohol, and drugs are among the top 20 risk factors for mortality, years of life lost, and disability. Most of the morbidity and mortality burden is attributable to tobacco, followed by alcohol, and drugs in third place (GBD 2013 Risk Factors Collaborators, 2015). All of these substances, especially alcohol, have a significant impact on the health of the European population. The burden of disease derived from alcohol and drugs use is substantial; together, they represent 11% of the disability-adjusted life years (DALYs) lost in the European Union (EU) (GBD 2016 Alcohol and Drug Use Collaborators, 2018). Drug use is a complex behaviour, sometimes hidden, stigmatized and difficult to quantify (Hammarlund, Crapanzano, Luce, Mulligan & Ward, 2018). Almost all information in this respect comes from population surveys or more original strategies, such as the analysis of wastewater to identify products of human metabolic excretion. In both cases, the aim is to obtain real-time information on geographic and temporal patterns of substance abuse. The limitations of both methods have led to their combination and integration into a common strategy to obtain a clearer picture of this problem (Castiglioni, Borsotti, Senta & Zuccato, 2015). EU countries together reported more than 161,000 hospital discharges for mental and behavioural disorders arising from the use of illicit drugs and a further 707,000 for alcohol use in 2010 (Lievens, Vander Laenen & Christiaens, 2014). In Europe, most drug addiction treatments are provided on an outpatient basis. Approximately 1.1 million EU citizens with an alcohol use disorder were estimated to have received treatment in 2015 (Rehm et al., 2015) while in the same year approximately 1.4 million people were treated for use of illicit drugs in the EU, according to the European Report on Drugs (EMCDDA, 2017). In Spain, about 192,000 drug users and 27,500 alcohol users received treatment in 2015, the majority in outpatient settings, and in the last decade, the number of patients admitted to treatment each year has been between 47,000 and 53,000 (European Monitoring Centre for Drugs and Drug Addiction, Spain Country Drug Report 2018). The basic minimum data set, hereafter referred to as BMDS, is the widest-ranging clinical administrative database in Spain. It is mandatory to complete corresponding questionnaires in all public hospitals belonging to the Spanish national health system, and it is the largest database of those officially registered. The main advantage is that its large sample size provides significant statistical power

(Meléndez Frigola, Arroyo Borrell & Saez, 2016). In this study, we carried out a statistical analysis of the BMDS of the autonomous province Castilla y León to provide epidemiological and clinical information (mean age, sex, rural or urban origin) and reference parameters regarding the case records and operation of hospitals (diagnosis, average stay, as well as type of admission and discharge) and to highlight trends regarding addictions.

Covering 94,223 km<sup>2</sup> (18.6% of the total area of Spain), Castilla y León is one of the largest regions in Europe. It has a population of approximately 2.5 million, 5.16% of the total Spanish population (Population Census, National Statistics Institute, Castilla y León, 2017), distributed in a balanced way across rural and urban areas, and within the latter, in large, medium and small cities. It also has a productive structure, as well as regionally uneven economic development. Such diversity means Castilla y León offers a unique context in Spain and Europe in which to carry out epidemiological studies.

The study of trends in the prevalence of addictions and other pathologies plays a central role in epidemiology and public health (Miquel et al., 2018a; Ruch et al., 2019). The analysis of hospitalization rates linked to these diseases is useful for determining their real impact, and the results of the study could help, for example, in the interpretation of the effectiveness of drug prevention campaigns, or provide a model of health policy assessment. Further, administrative databases, which allow the analysis of large volumes of health data (Russ et al., 2019), in this case relating to hospital admissions, have been useful in obtaining epidemiological information on different processes in the absence of specific records (Gfroerer, Adams & Moien, 1988).

The aim of this study was to determine changes in trends regarding hospitalization rates for alcohol and drug addiction in psychiatric units over 11 years. The results of this study can provide the basis for a method to assess the effectiveness of future health interventions in the field of addiction.

## Method

A cross-association study of the basic minimum data set (BMDS) of hospital discharges from hospital centres in Castilla y León was carried out between 2005 and 2015. Patients were selected according to the International Classification of Diseases, 9th revision, Clinical Modification (ICD-9-CM).

For the purposes of this study, we considered the main diagnoses according to ICD-9-CM (ICD-9-CM, Coding manual) at discharge, using the following codes: alcohol (303, 305.0), opioids (304.0, 304.7, 305.5), cocaine (304.2, 305.6), cannabis (304.3, 305.2), sedatives (304.1, 305.4), amphetamines (304.4, 305.7), hallucinogens (304.5, 305.3)

and other/unspecified drugs (304.6, 304.8, 304.9, 305.8). This study analyses hospitalizations, and the same patient may have been hospitalized on several occasions.

Hospitalization rates per inhabitant were also calculated using population data from Castilla y León, 2005-2015. We applied a general descriptive statistical analysis (considering all addiction diagnoses) for each substance under study, covering hospitalization rates/100,000 inhabitants/year and trend throughout the 11 years studied, overall and by sex. Hospital mortality rates/1000 hospitalizations and trends were also obtained for the 11 years studied, overall and by sex.

The trend analysis to determine if there were changes with statistically significant differences over time in the rates was performed using joinpoint linear regression (Joinpoint Trend Analysis Software provided by US National Cancer Institute, Surveillance Research Program). This test assesses the trend over time (years) for selected hospital discharges. In this analysis, the points of change (joinpoints) show statistically significant changes in the trend (ascending or descending). Graphically, joinpoint models applied to the logarithm of the rate describe a sequence of connected segments. The point at which these segments come together is a joinpoint, and represents a statistically significant change in trend. For each segment, the annual percentage change for each trend was also calculated using generalized linear models, assuming a Poisson distribution and showing the associated level of statistical significance with 95% confidence intervals (95% CI) in each case, as well as hospitalization and mortality rates stratified by sex with their respective 95% CI and statistical significance. Open access software from the Research and Surveillance Program of the United States National Cancer Institute was used. Values of  $p < 0.05$  were considered statistically significant differences. Statistical analysis was performed with the SPSS v21.0 program.

The data supporting the findings of this study are available from the Dirección General de Sistemas de Información, Calidad y Prestación Farmacéutica, Valladolid (Spain), subject to legal restrictions (Law 16/2003, May 28, on the cohesion and quality of the Spanish National

Health System). Appropriate authorization was obtained to use these data in our study; access conditions can be found here <https://www.boe.es/eli/es/1/2003/05/28/16>.

## Results

The hospital network in Castilla y León comprises 14 centres, of which three are regional, six provincial and five reference centres, structured according to health area and the availability of different medical specializations.

The BMDS of hospital discharges in Castilla y León between 2005 and 2015 consisted of 3,359,572 records, of which 52,692 corresponded to discharges from psychiatric units. From these, the diseases under consideration were selected using the codes shown above, with 3,758 hospitalizations registered (7.1%) for these diseases between 2005 and 2015. The most frequently found diagnosis was alcohol-related disorders, making up 3,044 of the 3,758 (81%). The total number of 52,692 hospitalizations for psychiatric diagnoses was used to calculate the ratio (Table 1).

Of the discharges analyzed, 74.9% were men compared to 25.1% women. This ratio is quite stable for cases related to alcohol, opiates, cocaine, cannabis, amphetamines and other drugs. However, in the case of sedatives, the percentage of women rose to 40.4%, with a correspondingly smaller difference to men (59.6%).

The sample had a mean age of 43.3 years, with a range from 31.4 years in the cannabis group to 45.11 years in the alcohol group. Alcohol was the substance involved in most cases (81%), followed by opiates (5.3%), cocaine (4%), cannabis (4%) and sedatives. (2.4%). A total of 3.4% of cases were classified as abuse or dependence on other substances, or not specified.

Regarding the origin of subjects, there was a clear predominance of urban over rural origin (7:3), both in the sample as a whole and for the different drugs.

Regarding the type of hospitalization, subjects were much more frequently admitted for emergencies than for scheduled visits (9:1), except in the case of opiates, where the difference between both types of hospitalization was smaller (56.8% and 43.2%), respectively.

Table 1. Sociodemographic and clinical characteristics for the sample as a whole and by diagnostic groups.

	Global	Alcohol	Cannabis	Amphetamines	Cocaine	Opioids	Sedatives
Cases	3758	3044	148	52	148	199	89
Age	43.4 (10.7)	45.11 (10.1)	31.47(9.9)	34.06 (10.6)	35.27 (8.5)	37.95 (7.8)	42.4 (11.9)
Average stay (days)	10.7 (11.3)	10.5 (11.3)	9.6 (12.2)	9.2 (7.3)	8.8 (8.4)	12.9 (12.1)	12.8 (13.1)
Sex (%)							
Men	74.9	74.7	77.7	73.1	79.7	81.9	60
Women	25.1	25.3	22.3	26.9	20.3	18.1	40

Note. Number of cases, mean age (with standard deviation), and percentages by sex. Mean hospital stay (with standard deviation) for each group of drugs analysed (alcohol, cannabis, amphetamines, cocaine, opioids, and sedatives) during the eleven years studied.

Medical discharges made up 93% of all hospitalizations (discharged on doctor's advice), compared to 6.9% of hospitalizations ending with voluntary discharge (against medical advice), although in hospitalizations where the main diagnosis was opioid abuse/dependence, the percentage of voluntary discharges was 15.1%. The average stay for the entire group was 10.7 days. Five patients died (0.13% of the total), all of whom had a primary diagnosis of alcohol abuse/dependence.

#### Analysis of trends in hospitalization rates

From 2005 to 2015, there was a downward trend in the hospitalization rate involving alcohol or other drug abuse or dependence as the main diagnosis (Figure 1), except for cannabis, which saw a rising trend between 2013 and 2015 (Figure 2; B).

- 1) In the case of alcohol abuse/dependence as the main diagnosis, the same downward trend was maintained as for the entire sample in the number of admissions between 2005 and 2015, taking into account that alcohol abuse/dependence represented the majority of the sample analysed (Figure 2; A).
- 2) For opioid abuse/dependence, the downward trend in the number of admissions was less noticeable than for other substances (Figure 2; E).
- 3) For sedative abuse/dependence, there was a downward trend in the number of admissions (Figure 2; F).
- 4) For cocaine abuse/dependence, there was a very significant downward trend in the number of admissions (Figure 2; D).
- 5) For cannabis abuse/dependence, the number of admissions remained stable between 2005 and 2013, but between 2013 and 2015 there was a very significant annual increase of 29.3% (Figure 2; B).

- 6) The number of admissions for abuse/dependence on amphetamines and other drugs also decreased (Figure 2; C).
- 7) The number of admissions for other drugs fell annually and continuously by 4.4% (not statistically significant) (Figure 2; G).
- 8) The number of admissions for polydrug use remained stable, at around 0.25% of hospitalizations, without significant changes (Figure 2; H).

## Discussion

This study offers three innovative aspects in the field of addictions in our context. Firstly, the use of a database such as the BMDS of hospital discharges, the analysis of which converts data into useful information for health-related decision-making, not only in the context of the years analyzed but also currently, given that no similar information has been published recently. Secondly, the application of a cross-association study, common in epidemiological research, and more than a mere description given its coverage of the clinical reality of discharges across a wide network of hospitals (Meléndez Frigola et al., 2016). Finally, the statistical methodology used, joinpoint regression models, which have already proven very effective in identifying trend changes in different pathologies over time (Kim, Fay, Feuer & Midthune, 2000).

The results of the study showed a general tendency for hospitalization rates to decrease for alcohol and drug-related conditions during the 11 years analyzed; this could be linked to prevention and outpatient treatments, strategies of the successive Regional Plans on Drugs of Castilla y León (Junta de Castilla y León, 2010, Plan Regional sobre Drogas de Castilla y León). This decrease is similar to that of hospitalizations related to the abuse or dependence

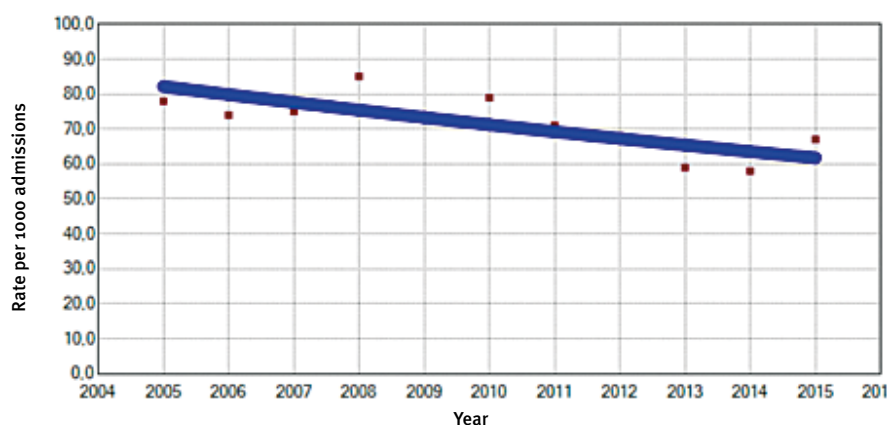


Figure 1. Admission rates for addictions (all codes: 303; 304; 304.0; 304.1; 304.2; 304.3; 304.4; 304.5; 304.6; 304.7; 304.8; 304.9; 305; 305.2; 305.3; 305.4; 305.5; 305.6; 305.7; 305.8; 305.9) per 1,000 admissions.

Note. From 2005 to 2015, there were 0 joinpoints; the APC de 2005–2015 was  $-2.81$  (CI 95%,  $-4.6$  a  $-1$  p  $< 0.05$ ). APC: annual percentage change; CI 95%: confidence interval of 95%. [\*]: statistically significant APC. Red points: exact annual value. Lines represent trends, the blue line represents only a monotonic trend. X axis: years (from 2004 to 2016). Y axis: discharge rate for addictions (alcohol and all drugs studied); medication discharge rates/1,000 hospital discharges.

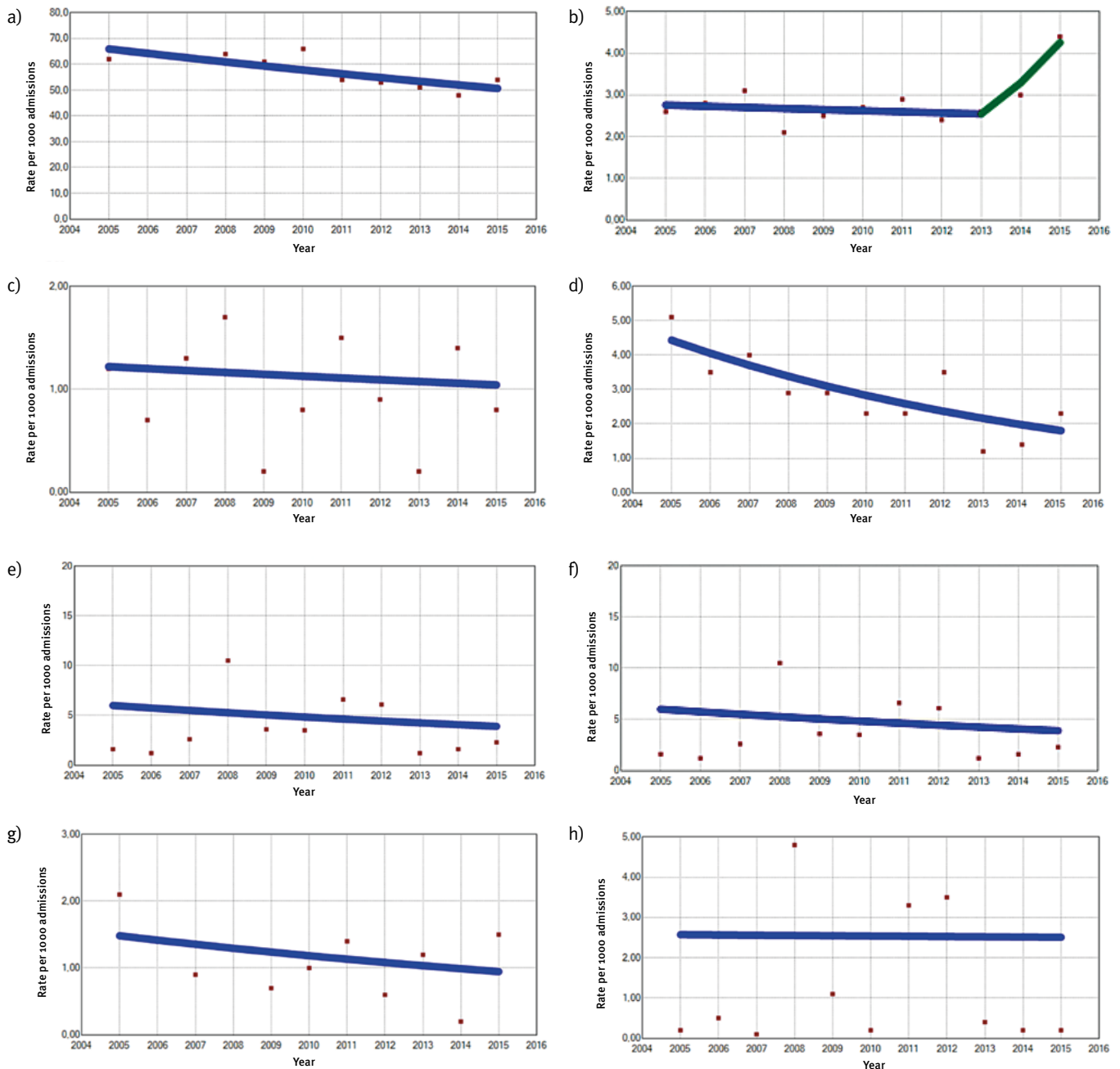


Figure 2. Admission rate per 1,000 admissions. Group analysis of the diseases studied. The points of change represent the joinpoints and the APC (Annual Percentage Change).

Note. [A] alcohol, 0 joinpoints, APC 2005–2015  $-2.60$  [CI 95%,  $-4.0$ – $-1.2$ ]  $p < 0.05$  \*; [B] cannabis, 1 joinpoint (2013), APC 2005–2013  $-1.00$  [CI 95%,  $-5.6$  to  $3.8$ ,  $p < 0.6$ ], APC 2013–2015  $29.3$  [CI 95%,  $11.5$ – $88.8$ ,  $p < 0.1$ ]; [C] amphetamines, 0 joinpoints, APC 2005–2015  $-1.56$  [CI 95%,  $-11.2$  to  $9.2$ ,  $p < 0.7$ ]; [D] cocaine, APC 2005–2015  $-8.6$  [CI 95%,  $-13.6$  to  $-3.2$ ],  $p < 0.05$  \*; [E] opioids, 0 joinpoints, APC 2005–2015  $-4.21$  [CI 95%,  $-21.8$  to  $-17.4$ ,  $p < 0.6$ ]; [F] sedatives, 0 joinpoints, APC 2005–2015  $-5.53$  [CI 95%,  $-12.7$  to  $-2.3$ ,  $p < 0.1$ ]; [G] other specified pharmaceuticals, 0 joinpoints, APC 2005–2015  $-4.39$  [CI 95%,  $-12.6$  to  $4.6$ ,  $p = 0.3$ ]; [H] pharmaceutical combinations, 0 joinpoints, APC 2005–2015  $0.25$  [CI 95%,  $-28.9$  to  $39.9$ ,  $p < 1.0$ ]. APC: annual percentage change; CI 95%: confidence interval of 95%. (\*): statistically significant APC. Red points: exact annual value. Lines represent trends, with colours changing where joinpoints were identified. A blue line represents only a monotonic trend. X axis: years (from 2004 to 2016). Y axis: discharge rate for each drug studied; medication discharge rates/1,000 hospital discharges.

of psychoactive substances reported in the Community of Madrid between 2003–2015 (Comunidad de Madrid, 2017, Informe sobre evolución por abuso o dependencia de sustancias psicoactivas CMBD 2003–2015). Among the findings, we can highlight that alcohol is the substance with the greatest impact on hospitalization, causing the highest number of hospitalizations (3,044) and a mean stay of  $10.5 \pm 11.3$  days, similar to the overall mean stay ( $10.7 \pm$

11.3 days). In this regard, the findings seem to be consistent with those observed in previous studies (Miquel et al., 2018a; Miquel et al., 2018b).

Our attention, however, is drawn to the change in trend that occurred between 2013 and 2015 for cannabis, with an annual increase of 29.3% in hospitalizations linked to the use of this substance during the two-year period. The Eurobarometer survey shows a slight increase in cannabis



use between 2011 and 2014 among young people in the European Union (Flash Eurobarometer 330, 2011) (Flash Eurobarometer 401, 2014). In its 2015 World Report on Drugs, the United Nations Office on Drugs and Crime showed data from 2013 indicating that cannabis use is increasing and remains high in western and central Europe. Furthermore, the last decade has seen a growth in the potency of cannabis, usually measured by the degree of concentration of THC ( $\Delta^9$ -tetrahydrocannabinol, the main psychoactive ingredient in cannabis), in many markets, giving rise to increasing concern regarding the potential of cannabis to cause serious health problems. In addition, synthetic cannabinoids have entered the market (López Corbalán, Seguí Ripoll, Romero Escobar, Luna Ruiz-Cabello & Luna Maldonado, 2014), and their use has also been linked to serious adverse health events such as hospitalization (United Nations Office on Drugs and Crime, 2017, World Report on Drugs). Regarding Spain, the 2017 Report of the European Monitoring Centre for Drugs and Drug Addiction indicates that the prevalence of cannabis use in the population aged 15 to 64 who use cannabis daily increased between 2013 and 2015, although the total number of admissions to outpatient treatment for cannabis use in 2015 was slightly lower than that registered in 2013 and 2014. Among users presenting problems related to the use of cannabis as the main drug, it is estimated that one in five receive hospital treatment. Perhaps the results of the study regarding increased cannabis-related hospitalizations are due to changes in the composition of the drug, with an increase in the 'psychotizing' effects leading to an increase in morbidity, or simply a consequence of increased use. We have failed to find comparable scientific evidence with which to assess these results against others in Spain, but due to the magnitude of the increase and the large sample, it cannot be an incidental finding (Leos-Toro, Rynard, Murnaghan, MacDonald & Hammond, 2019; Nosyk, Wood & Kerr, 2015).

Another group that also deserves special attention is opioid hospitalizations, which have seen a downward trend (PAC: -4.21%). Opioid substitution therapy reduces use and injection risk, improves physical and mental well-being, and reduces mortality (Mattick, Breen, Kimber, & Davoli, 2009). Our data do not support the hypothesis of a new opioid-use epidemic, such as that endured in Spain in the 1980s and 1990s (Mur Sierra & Ortigosa Gómez, 2014) or currently afflicting the USA (Smith, 2017). However, this study has the limitation that it considered exclusively admissions with the main diagnosis of drug use, while this population is frequently hospitalized for other reasons. It must be taken into account that diagnoses of addiction are not the only pathologies contributing to the global burden of disease attributed to the use of alcohol and drugs. A high proportion of the disease burden linked to them would be due to an increased risk of accidents, unintentional

injuries, suicide, cancer and the consequences of chronic HIV and/or hepatitis C infection, etc. It is clinically relevant that the five patients who died during period studied were alcohol users, although hospital mortality is very low in any case (Schoepf & Heun, 2015).

Regarding the analysis by sex, hospitalization for alcohol and drugs is much more frequent in men (74.9% vs. 25.1%). The smallest difference between both sexes was for sedatives (50.9% vs. 49.1%, respectively). These data are interesting since the social stigma for women caused by requesting health care for an addictive pathology can mask the real data, which is not the case with hospital records such as the BMDS, thus highlighting the need to include the gender perspective at all levels of the health process and promote treatments aimed at women.

The limitations of the study are that the data were obtained retrospectively from a nonspecific clinical administrative database; although coding has not changed over the years and in different hospitals, individual coding practices may differ slightly between clinicians and encoders. Nevertheless, the study of large homogeneous and consolidated databases such as the BMDS is recognized as a reliable and trustworthy approach when seeking to investigate the reality of a pathology. A further limitation of this study is that it considers exclusively hospitalizations where drug use is the main diagnosis, and this population is frequently hospitalized for other pathologies that could also contribute to the global burden of disease attributed to the use of alcohol and drugs.

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## Conflict of interests

The authors declare no conflicts of interest.

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# The UPPS model of impulsivity in the abuse of Information and Communication Technologies (ICT)

## *El modelo UPPS de impulsividad en el abuso de las Tecnologías de la Información y la Comunicación (TIC)*

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### Abstract

The UPPS model of impulsivity has recently been proposed, has been widely applied to substance abuse and is one of those recommended in the context of Research Domain Criteria, RDoC. However, its application to the abuse of information and communication technologies (ICTs) has been very limited. In the present work, a sample of  $n=748$  (67% females) was recruited through the Internet, and the reduced version of the UPPS-P was administered, in addition to the MULTICAGE-TIC and the Prefrontal Symptoms Inventory (PSI-20). The psychometric properties of UPPS-P were satisfactory in terms of internal consistency ( $0.87 > \omega > 0.75$ ) and structural validity. Impulsivity measured by UPPS-P correlated with all MULTICAGE-TIC scales, although with a very small effect size, and with greater magnitude with prefrontal dysfunction symptoms. The impulsivity dimension most related to ICT abuse was Urgency ( $0.3 > r > 0.2$ ). A structural analysis of all the variables was carried out, with impulsivity appearing as a product of the prefrontal malfunction that predicted, through Positive Urgency, the abuse of ICTs. Impulsivity does not seem to be the central nucleus of ICT abuse, but rather failures in the superior control of behavior, of which impulsivity would be a consequence, but not the most important. This makes it advisable to design cognitive rehabilitation interventions that improve the functioning of superior behavior control mechanisms in the prevention and treatment of ICT abuse.

**Keywords:** Addictive behavior; impulsive behavior; compulsive behavior; prefrontal cortex; public health; modeling of structural equations; behavioral addictions; abuse of information and communication technologies.

### Resumen

El modelo UPPS de impulsividad se ha propuesto recientemente, ha sido ampliamente aplicado al abuso de sustancias y es uno de los recomendados en el contexto de investigación *Research Domain Criteria*, RDoC. Sin embargo, su aplicación al abuso de tecnologías de la información y la comunicación (TIC) ha sido muy limitado. En el presente trabajo se reclutó a través de Internet una muestra de  $n=748$  (67% mujeres) y se administró la versión reducida de la UPPS-P, además del MULTICAGE-TIC y el Inventario de Síntomas Prefrontales (ISP-20). Las propiedades psicométricas de la UPPS-P resultaron satisfactorias en consistencia interna ( $0,87 > \omega > 0,75$ ) y validez estructural. La impulsividad medida por la UPPS-P correlacionó con todas las escalas del MULTICAGE-TIC, aunque con un tamaño del efecto muy pequeño, y con mayor magnitud con las de síntomas de mal funcionamiento prefrontal. Las dimensiones de impulsividad más relacionadas con el abuso de las TIC fueron las de Urgencia ( $0,3 > r > 0,2$ ). Se realizó un análisis estructural de todas las variables apareciendo la impulsividad como un producto del mal funcionamiento prefrontal que predecía, a través de la Urgencia Positiva, el abuso de las TIC. La impulsividad no parece ser el núcleo central del abuso de las TIC, sino los fallos en el control superior de la conducta, de los que la impulsividad sería una consecuencia, pero no la más importante. Ello hace recomendable el diseño de intervenciones de rehabilitación cognitiva que mejoren el funcionamiento de los mecanismos de control superior de la conducta en la prevención y tratamiento del abuso de las TIC.

**Palabras clave:** Conducta adictiva; conducta impulsiva; corteza prefrontal; modelado de ecuaciones estructurales; adicciones comportamentales; abuso de tecnologías de la información y la comunicación.

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Impulsivity is a widely studied psychological construct and is usually linked to a variety of psychological manifestations. There is, however, no theoretical consensus regarding the true meaning of the construct, which has been defined in very different ways by each theoretical approach (Nigg, 2017). In general, it refers to behaviors carried out without sufficient reflection, focused on immediate goals, without calculating medium- and long-term consequences (Evenden, 1999), although in certain circumstances they may also represent behaviorally adaptive options (Dickman, 1990). This type of behavior is usually linked to multiple psychopathological manifestations, including self-injurious and suicidal behaviors (Lockwood, Daley, Townsend & Sayal, 2017), violent behaviors (Bresin, 2019) and personality disorders (Gagnon, 2017), among many others. Neuropsychological studies have identified the neural substrates of the construct (Bari & Robbins, 2013; Chamberlain & Sahakian, 2007), which must necessarily be considered multidimensional (Rochat, Billieux, Gagnon & Van der Linden, 2018).

One of the areas in which impulsivity has been most studied is in substance dependence since impulsivity is considered a marker of vulnerability for the development of addictive behaviors (Lee, Hoppenbrouwers & Franken, 2019; Verdejo-García, Lawrence & Clark, 2008), something that has been proven in animal studies (Dalley, Everitt & Robbins, 2011). There is also evidence of increased impulsivity associated with addictive behaviors not involving substances (Grant & Chamberlain, 2014; Şimşek, Zincir, Özen & Ceyhan, 2019), although the different studies are very heterogeneous (Carvalho, Sette & Ferrari, 2018). From a neuropsychological perspective, response inhibition is a skill linked to the integrity of the dorsolateral prefrontal cortex, which allows the interruption or non-execution of automated behavior or an acquired habit when the non-interruption or execution of the behavior will be unsuitable and result in an error (Fuster, 1997). Deficits in the response inhibition system and inhibitory control are a central element in addictive behaviors, according to the consensus reached recently by a group of scientists in the framework of the *Research Domain Criteria*, RDoC (Yücel et al., 2019), research project.

This group considers that one of the instruments most suitable for its measurement is the UPPS (Whiteside & Lynam, 2001). The authors of this test noted the general confusion between the various conceptualizations of impulsivity and decided to eschew any specific position on the nature or causes of impulsivity, attempting instead to capture what they believed to be various etiological pathways of impulsive behavior. To do this, they used exploratory factor analysis to assess the various facets of the NEO-PI-R instrument (Costa & McCrae, 1992) related to impulsivity and up to eight impulsivity scales of very different theoretical orientations. With the set of items selected for each of

the factors, the authors developed the new questionnaire, called the UPPS *Impulsive Behavior Scale*, in which they identified four traits: *negative urgency* (impulsive behavior arising as a reaction to intense negative affect); [lack of] *premeditation*, which implies the ability to choose an option while taking possible consequences into account; [Lack of] *perseverance* (the ability to stay on task, especially if it is difficult or boring); and *sensation seeking* (the tendency to look for new activities or activities that involve risk). These dimensions made it possible to understand impulsivity through its emotional/affective aspects (in *urgency* and *sensation seeking*) as well as through more cognitive aspects (in *lack of perseverance* and *premeditation*). In the original UPPS review (UPPS-P; Lynam, Smith, Cyders, Fischer & Whiteside, 2007) a fifth dimension was incorporated: *positive urgency*, defined as the propensity to act rashly triggered by intense positive affect. These five impulsivity traits can be measured with the 59-item UPPS-P, from which a shortened version of 20 items was subsequently developed (Billieux et al., 2012).

The traits comprising the UPPS model have been found to be strongly linked to neural substrates, specific to a certain degree for each one and primarily involving fronto-cortical circuits with subcortical structures (Rochat et al., 2018). These findings have been replicated in particular in the study of addictive behaviors linked to various substances (Yücel et al., 2019).

The initial four-scale version has been used increasingly often in the study of substance addiction (Whiteside & Lynam, 2003; Magid & Colder, 2007) as well as in non-substance-related addictive behaviors (Billieux, Rochat, Rebetz & Van der Linden, 2008; Billieux, Van der Linden, M. & Rochat, 2008; Billieux et al., 2011; Rømer Thomsen et al., 2018), among other psychological problems. The revised version, UPPS-P, has also been used in the study of abuse of substances such as alcohol (McCarty, Morris, Hatz & McCarthy, 2017), cannabis (VanderVeen, Hersherberger & Cyders, 2016) and tobacco (Kale, Stautz & Cooper, 2018).

Despite this, there are scarcely any studies which apply it to so-called non-substance addictive behaviors. There is currently considerable controversy over whether such behaviors should really be considered addictions, with the prevailing view being that this comparison is not permissible (Billieux, Schimmenti, Khazaal, Maurage & Heeren, 2015; Panova & Carbonell, 2018; Yu & Sussman, 2020). Opposing this view, many authors consider that the circuits involved in so-called behavioral addictions are essentially the same as in substance addiction (Horvath et al., 2020; Yao et al., 2017). What both perspectives share is the consideration that in both cases a prefrontal hypofunction occurs that results in a loss of higher behavior control.

The UPPS has been used in the study of online sexual activity (Savidou et al., 2017), problematic Internet use (Navas, Torres, Cándido & Perales, 2014) and pathological

gambling (Jara-Rizzo et al., 2019; Wéry, Deleuze, Canale & Billieux, 2018). While pathological gambling is mainly linked to *negative urgency*, online sexual activity is especially related to *positive urgency*, and Internet abuse is not linked to any dimension in particular. These differences could potentially serve to classify behaviors maintained by negative or positive reinforcement.

The UPPS-P has been translated to and validated in Spanish, both in its full version (Verdejo-García, Lozano, Moya, Alcázar & Pérez-García, 2010) and its short form (Cándido, Orduña, Perales, Verdejo-García & Billieux, 2012). The present study aims to investigate some psychometric properties of the short UPPS-P and subsequently analyze the relationships between the impulsive dimensions of the UPPS model, the use/abuse of information and communication technologies (ICT) and symptoms of prefrontal malfunction.

## Method

### Participants

A sample of  $n = 764$  was obtained. No exclusion criteria were set, particularly with regard to age, since the responses in all age groups were of interest. After an outlier detection analysis, 16 participants with atypical scores (2.1%) were excluded, leaving a final reduced sample of  $n = 748$ . Table 1 shows the descriptive statistics of the final sample, 93.6% of whom were born and lived in Spain.

### Instruments

Short version (20 items) of the UPPS-P (Lynam, 2013), Spanish version (Cándido et al., 2012). This measures five impulsivity traits (four items each): *negative urgency*, *lack of premeditation*, *lack of perseverance*, *sensation seeking*, and *positive urgency*. Item responses are on a four-point Likert-type

scale from 1 (strongly agree) to 4 (strongly disagree). The score is inverted in the two *urgency* scales and in *sensation seeking* so that they can all be scored in the direction of impulsivity, with each having a scoring range from 4 to 16. The internal consistency of the five scales, estimated using Cronbach's  $\alpha$ , ranged from 0.61 to 0.81, with the two *urgency* scales below 0.7, which is considered to be the lowest acceptable limit.

MULTICAGE-TIC, a 20-item questionnaire comprising five scales surveying problems related to the use of the Internet, mobile phones, video games, instant messaging and social networks (Pedrero-Pérez et al., 2018). It is based on MULTICAGE CAD-4, a screening questionnaire for compulsive behavior, with and without substances (Pedrero-Pérez et al., 2007), which has been used in primary care (e.g., Reneses et al., 2015), behavioral addictions (e.g., Megías et al., 2018) and substance addiction (e.g., Navas, Torres, Cándido & Perales, 2014). Subsequently, a mobile phone use/abuse scale was included (Rodríguez-Monje et al., 2019). The MULTICAGE-TIC has four dichotomous response (yes/no) items for each problem behavior asking about the following: item 1, estimated excessive time dedication; item 2, excessive time estimated by significant others; item 3, difficulty in refraining from the behavior; item 4, difficulties in voluntarily interrupting the behavior. The score on each scale is the number of affirmative responses, ranging from 0 to 4 points, 0 corresponding to the absence of the problem and 4 to abuse. The psychometric study showed adequate internal consistency for all its scales ( $0.74 < \alpha < 0.93$ ) and evidence of structural validity.

Prefrontal Symptoms Inventory, screening version (PSI-20; Pedrero-Pérez, Ruiz-Sánchez de León, Morales-Alonso, Pedrero-Aguilar & Fernández-Méndez, 2015). This explores symptoms of malfunction in daily life linked to neuropsychological disorders attributable to the prefrontal cortex. This scale has 20 items with Likert-type responses (0: never or almost never; 1: a few times; 2: sometimes yes, sometimes no; 3: many times; 4: always or almost always). The factorial study found a three-factor solution: behavioral control problems, emotional control problems and social behavior problems. Higher scores correspond to more prefrontal malfunction symptoms. Validation in both the general population and people being treated for addictive behaviors reported adequate internal consistency for all subscales ( $0.87 < \alpha_s < 0.89$ ). In our sample, the multivariate consistency of the complete test was  $\alpha_s = 0.91$  and that of the scales  $0.81 < \alpha_s < 0.90$ .

### Procedure

Since the target population was regular ICT users, a survey was developed using Google Docs® and anonymous and voluntary participation was sought through instant messaging programs (WhatsApp®), social networks (Facebook®, Instagram®) and email. At the same time, participants were

Table 1. Sample descriptives.

	Men	Women	Total
n	245 (32.8%)	503 (67.2%)	748
Age			
18 - 24	28 (23.7%)	90 (76.3%)	118 (15.8%)
25 - 30	38 (36.2%)	67 (63.8%)	105 (14.0%)
31 - 45	67 (33.5%)	133 (66.5%)	200 (26.7%)
46 - 60	86 (35.2%)	158 (64.8%)	244 (32.6%)
> 60	26 (32.1%)	55 (67.9%)	81 (10.8%)
Education			
Primary or lower	8 (44.4%)	10 (55.6%)	18 (2.4%)
Lower secondary	13 (72.2%)	5 (27.8%)	18 (2.4%)
Higher secondary	52 (47.7%)	57 (52.3%)	109 (14.6%)
University student	18 (24.7%)	55 (75.3%)	73 (9.8%)
University degree	154 (29.1%)	376 (70.5%)	530 (70.9%)

asked to forward the questionnaire to their contacts, thus a chain sampling technique was used. The online questionnaire was restricted to prevent it being completed more than once on the same device. Since participation was voluntary, subjects were told about the aims of the study, but informed consent was not included as it was implicit in completing the test. Data collection ran from January 2 to February 12, 2019, and a sample of  $n = 764$  was finally obtained. This sample was considered large enough since the ratio between the sample  $n$  and the number of items (60 in total) was higher than 10, which is usually considered adequate according to the most demanding criteria.

### Data analysis

Firstly, in order to detect and exclude outliers, an analysis was performed using the Mahalanobis distance with a  $p < 0.001$  criterion. The univariate descriptions of the items were then obtained and the Mardia (1970) criterion was applied to test whether the data fitted a multivariate normal distribution. Confirmatory factor analysis was carried out, using firstly the maximum likelihood method to favor comparability with previous studies, and then an unweighted least squares analysis as the method best suited to the nature of the data (Morata-Ramírez, Holgado-Tello, Barbero-García & Méndez, 2015). Two possible factorial solutions were compared by applying the goodness-of-fit indices in AMOS 21: absolute (GFI, AGFI, RMR), relative (NFI, RFI) and parsimonious (PGFI, PNFI). Suitable values were those exceeding 0.95 for GFI, AGFI, NFI and RFI, those below 0.05 for RMR and those closest to 1 in PGFI and PNFI. Once the best model was selected, the questionnaire structure was configured, also using AMOS 21. Internal consistency was studied using various estimators, as recommended when the data are not from linear variables or not normally distributed (Revelle & Zinbarg, 2009; Sijtsma, 2009); specif-

ically, standardized Cronbach's alpha ( $\alpha_s$ ; Enders & Bandalos, 1999) and McDonald's omega ( $\omega$ ) were used. A correlational study was performed using Pearson's  $r$  and a linear stepwise regression analysis, confirming the contribution to the model using  $R^2$  and effect size using  $\beta$ . In the multiple correlations, the Bonferroni correction was applied to avoid Type I error. Finally, path analysis was carried out to structurally link all the variables previously studied and by means of the previously used method and fit indices. The SPSS 22 statistical package and the AMOS 21 program were used for all analyses, except for internal consistency estimators, which were obtained through the FACTOR 10.10.01 program. (Lorenzo-Seva & Ferrando, 2006).

## Results

### Confirmatory factor analysis (CFA)

On applying Mardia's criterion, it was seen that item distribution did not fit multivariate normality ( $p < 0.001$ ). We examined whether the theoretical model fitted the data obtained in the present study. First, a maximum likelihood analysis was carried out, which provided acceptable fit indices in almost all cases (CMIN/DF = 3.28; NFI = 0.905; RFI = 0.887; IFI = 0.932; TLI = 0.919; CFI = 0.932; PNFI = 0.760; RMSEA = 0.055). As most previous studies have used this method, it was calculated here to make results comparable. However, and given the nature of the data (non-continuous Likert scale and absence of multivariate normality in data distribution), an unweighted least-squares analysis was then performed as the most suitable method. The fit indices of a 3-factor (with *urgency* grouped into a single factor, and *lack of perseverance* and *premeditation* into another) and a 5-factor solution were studied. Both solutions showed an adequate fit to the data, although the 5-factor (GFI = 0.985; AGFI = 0.980; PGFI = 0.750; NFI = 0.973; RFI = 0.968; PNFI

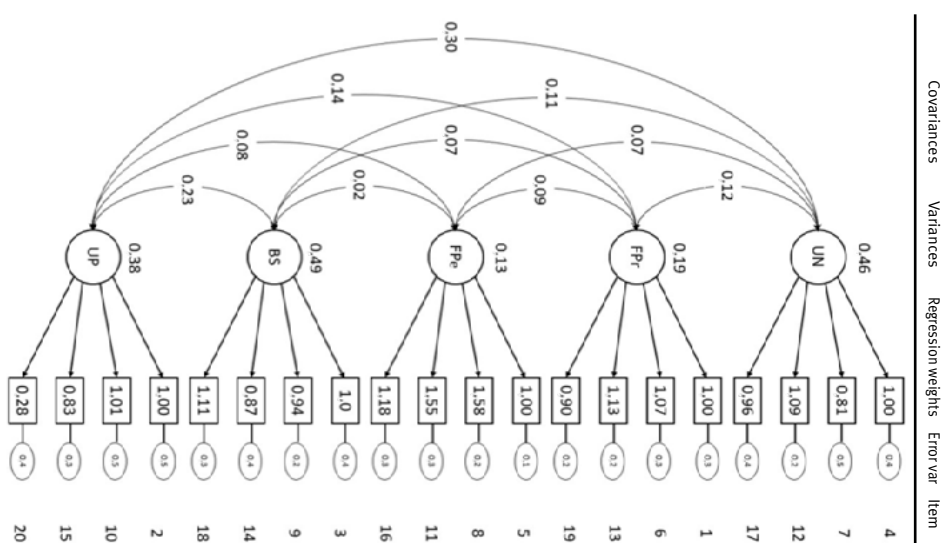


Figure 1. Structure of short UPPS-P.

Nota. NU = Negative Urgency; LPr = Lack of Premeditation; LPe = Lack of Perseverance; SS = Sensation seeking; PU = Positive Urgency.

= 0.820; RMR = 0.028) was slightly higher than the 3-factor solution (GFI = 0.959; AGFI = 0.949; PGFI = 0.763; NFI = 0.930; RFI = 0.920; PNFI = 0.817; RMR = 0.046. The resulting model is shown in Figure 1.

### Internal consistency

Table 2 shows the internal consistency estimators of the short UPPS-P scales. It can be seen that, as in the validation study (Cándido et al., 2012), the values for the two *urgency* scales are unacceptable (< 0.70) when Cronbach's  $\alpha$  is applied, but when the estimators most appropriate to the nature of the data are applied, internal consistency is acceptable in all cases.

### Relationship with ICT abuse

Table 3 shows the correlations obtained between the UPPS-P and MULTICAGE-TIC scales. As can be seen, there

are significant correlations in almost all cases, except in the use/abuse of video games. However, the effect size of such differences is very small. Table 4 shows the resulting regression models for each MULTICAGE-TIC scale. In all cases, the proportion of the variance of the use/abuse of each ICT is very low, with the *urgency* scales (positive and negative) contributing most to the models, although again with a very small effect size.

### Relationship with prefrontal symptoms

Table 6 shows the correlations obtained between the UPPS-P and PSI-20 scales. In this case, the effect sizes of the correlations obtained between both *urgency* scales and the *lack of perseverance* scale with all the subscales and the total score on the PSI-20 were considerable, and somewhat less so with the others.

Table 2. *Reduced UPPS-P internal consistency estimators.*

	$\alpha$	$\alpha_s$	$\omega$
Negative urgency	0.67	0.87	0.87
Lack of premeditation	0.82	0.82	0.82
Lack of perseverance	0.78	0.86	0.86
Sensation seeking	0.84	0.89	0.89
Positive urgency	0.67	0.73	0.75

Note.  $\alpha$  = Cronbach's alpha;  $\alpha_s$  = standardised item;  $\omega$  = McDonald's omega.

Table 3. *Bivariate correlations between the scales of the reduced UPPS-P and the MULTICAGE-TIC.*

	Negative urgency	Lack of premeditation	Lack of perseverance	Sensation seeking	Positive urgency
Internet	0.20*	0.18*	0.14*	0.15*	0.24*
Mobile phones	0.22*	0.19*	0.12*	0.13*	0.26*
Video	0.10	0.10	0.08	0.12*	0.15*
Instant messaging	0.22*	0.12*	0.10	0.10	0.20*
Social networks	0.17*	0.18*	0.11*	0.20*	0.22*

Note. \* Significant correlation after Bonferroni correction ( $p < 0.005$ ).

Table 4. *Regression models of the UPPS-P scales reduced on each of the MULTICAGE-TIC scales.*

	Negative urgency	Lack of premeditation	Lack of perseverance	Sensation seeking	Positive urgency	Total % explained variance
	$R^2 \times 100$ ( $\beta$ )					
Internet	0.4% (0.09)	0.9% (0.10)			5.5% (0.16)	6.8%
Mobile phones	0.6 % (0.10)	0.9% (0.10)			6.6% (0.17)	8.1%
Video games					2.2% (0.15)	2.2%
Instant messaging	4.7% (0.16)				0.7% (0.11)	5.4%
Social Networks		0.9% (0.11)		1.3% (0.13)	4.8% (0.13)	7.0%

Table 5. *Bivariate correlations between the scales of the UPPS-P and the PSI-20.*

ISP-20	Negative urgency	Lack of premeditation	Lack of perseverance	Sensation seeking	Positive urgency
Social behavior problems	0.31*	0.26*	0.22*	0.25*	0.36*
Emotional control problems	0.46*	0.19*	0.20*	0.13*	0.39*
Executive control problems	0.40*	0.27*	0.47*	0.12*	0.35*
Total	0.50*	0.31*	0.44*	0.18*	0.45*

Note. \* Significant correlation after Bonferroni correction ( $p < 0.025$ ).

### General structural model

Figure 2 shows the predictive relationships between all the variables used. To simplify the image, two restrictions were imposed: (a) the five subscales were used, proposed by the authors as the best solution; and (b) regression weights below 0.15 were removed. The model thus obtained achieved adequate fit indices (GFI = 0.997; AGFI = 0.992; NFI = 0.972; RFI = 0.936), although they could have been better in some cases (RMR = 0.479; PGFI = 0.363; PNFI = 0.424). It can be seen how, on the one hand, the greatest predictive capacity corresponds to *prefrontal symptomatology* on the UPPS-P subscales, and, on the other, that *positive urgency* predicts all the MULTICAGE-TIC use/abuse scales, albeit with small effect size. *Negative urgency* only shows poor predictive capacity for instant messaging use/abuse, *lack of premeditation* predicts the use/abuse of mobile phones and social networks, *sensation seeking* only predicts the latter, and *lack of perseverance* is not significantly predicted by any ICT scale.

### Discussion

The aim of this study was to examine the application of the UPPS-P questionnaire, in its short 20-item version, in a sample of people using or abusing information and

communication technologies. The test showed adequate psychometric properties in its application to the sample obtained in the present study. Confirmatory factor analysis yielded adequate indices of fit to the data of the theoretical five-scale structure. As in the initial validation study of the Spanish version (Cándido et al., 2012), an alternative three-scale structure was tried in which the two *urgency* scales were merged on the one hand, and the *lack of premeditation* and *perseverance* one the other; this also had adequate fit to the data, but was bettered by the five-scale model.

The internal consistency of the five scales was adequate in all cases when multivariate estimators were used. This was not the case when only Cronbach's  $\alpha$  was applied in the validation study, something unacceptable at the current level of knowledge (McNeish, 2018) yet common in previous validation studies of the questionnaire (Billieux et al., 2012; Bteich, Berbiche & Khazaal, 2017; D'Orta et al., 2015; Dugré, Giguère, Percie du Sert, Potvin & Dumais, 2019; Fossati et al., 2010; Verdejo et al., 2010).

When the UPPS-P and MULTICAGE-TIC scales were compared, it was observed that almost all correlations were statistically significant, but that effect sizes were very small in all cases: the maximum coefficient of mutual correlation is that between the use/abuse of mobile phones and *positive urgency* ( $r^2 = 0.068$ ), which can be interpreted as each

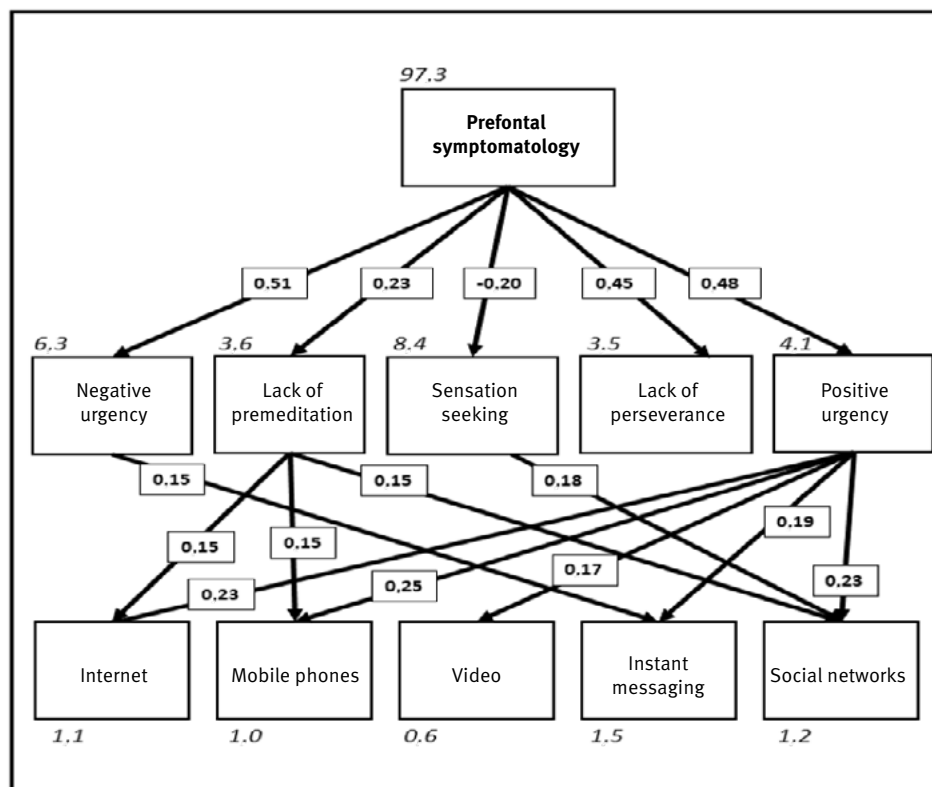


Figure 2. Structural model linking prefrontal symptoms, UPPS-P subscales, and ICT use / abuse scales.

Note. In *italics*, error variance; boxed and bold, standardized regression weights. Regression weights below |0.15|.



variable only being capable of predicting 6.8% of the other. These results contrast with those obtained on the same sample when ICT-related compulsivity was explored, some variables reaching up to 40% of mutual determination (Pedrero-Pérez, Morales-Alonso & Ruiz-Sánchez de León, 2021). Based on these data, it may be deduced that ICT abuse is a behavior better governed by the rules of compulsion (avoidance of discomfort, governed by negative reinforcement) rather than by those of impulsivity (search for gratification, governed by positive reinforcement). In reality, *negative urgency* as defined by the UPPS model does not differ from the definition of compulsivity: the authors define *negative urgency* as the tendency to experience strong impulses, often under conditions of negative affect, so that those who score high on *negative urgency* engage in impulsive behaviors in order to alleviate negative effects despite the damaging long-term consequences of these actions (Whiteside & Lynam, 2001).

On eliminating common variance in one regression model, it is observed that the set of impulsivity scales predicts, at most, 8% of the ICT abuse scales, and that only *positive urgency* contributes significantly to the models, although in no case does this reach 7%. The exception is *instant messaging use/abuse*, which would be better predicted by *negative urgency*. In other words, while use of the mobile phone and its applications would be linked to the gratification they provide, *instant messaging use/abuse* would be governed by the reduction of the discomfort caused by the uncertainty of not knowing the content of the messages or as a way of escaping discomfort by producing messages. However, in both cases the contribution of the impulsivity scales is minimal compared to that obtained when considering compulsivity (Pedrero-Pérez et al., 2021).

When the impulsivity scales are correlated with those of prefrontal malfunction symptoms, the relationships with the *urgency* and *lack of perseverance* scales are consistent, and somewhat less so with *lack of premeditation*. The effect is greater when related to problems of *executive functioning*, as might be expected. Just as predictably, the urgency scales also correlate strongly with problems of *emotional control*. In contrast, *sensation seeking* has very small effect size in all its correlations. The latter is probably more of a stable personality trait (Hughson et al., 2019), while the rest of the UPPS-P scales are applied to tendencies of behavioral functioning more dependent on the stimulus context.

The joint structural model links the three levels being examined: symptoms of prefrontal malfunction, impulsivity and ICT use/abuse. What can be observed is the strong capacity of prefrontal malfunction to predict all aspects of impulsive behavior and the central role of *positive urgency* on ICT abuse. *Urgency* in the search for reinforcement reduces reflective capacity and favors involvement in the use of ICT beyond prefrontal control due, as previously mentioned, to the failure of executive control mechanisms, but

also to a lack of control of emotional inputs. This model suggests that the best way to improve the use and reduce the abuse of ICTs would be the development of cognitive stimulation and rehabilitation programs that improve the higher behavior control mechanisms, relating both to executive and emotional aspects. Cognitive rehabilitation has already shown its usefulness in the field of addictions with or without substances (Verdejo-García, Alcázar-Córcoles & Albein-Urios, 2019).

The main limitation of the present study is, without doubt, the sampling method. Diffusion through social networks does not allow control of the quality of participation, the motivation and sincerity of the participants, nor, of course, generalization of results. The only way to control the quality of the responses, at least globally, is to obtain a sample large enough so that the specific weight of inappropriate responses in the overall results is reduced. Atypical scores were detected so that random responses or inconsistent completion could be eliminated. The internal consistency and structural validity tests are also guarantees of correct completion. Nevertheless, this method of information gathering has been gaining increasing interest and its use is considered normal in psychosociological research (Geisen & Murphy, 2020). Future studies should find sampling methods which allow generalization of the results.

In conclusion, the UPPS-P in its reduced 20-item version is a consistent and structurally valid test for exploring impulsivity with the multidimensional UPPS model. Given the results, the impulsive components of ICT abuse are not the central nucleus of the problem, unlike when compulsive components have been analyzed. This consideration can guide the design of more effective interventions that should probably be oriented towards improving cortical, executive, and emotional control mechanisms, and the ability to generate valid response alternatives, rather than merely blocking or modifying excessive use behaviors.

## Conflict of interests

The authors declare no conflicts of interest.

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# Internet, video game and mobile phone addiction in children and adolescents: A case-control study

## *Adicción a Internet, videojuegos y teléfonos móviles en niños y adolescentes: Un estudio de casos y controles*

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### Abstract

The use of new technologies has become widespread worldwide. There is increasing concern about "Internet addiction disorder" (IAD), "Internet gaming disorder" (IGD), and "Mobile phone addiction" (MPA). Attention Deficit Hyperactivity Disorder (ADHD) has been associated with IAD and IGD. However, evidence is lacking about the relationship between ADHD and MPA. Naturalistic case-control study. 112 patients (51 children with and 61 children without ADHD) between 7 and 17 years old were compared regarding IAD, IGD, and MPA. We used the TEA questionnaire for the assessment of executive function and ADHD (ATENTO), and the ADITEC questionnaire to get gender-differentiated information for IAD, IGD, and MPA. Female children scored higher on MPA (Mean  $\pm$  Standard Deviation,  $M \pm SD$ ) ( $25.93 \pm 17.64$  vs.  $14.77 \pm 19.43$ ,  $p=0.03$ ), while male children scored higher on IGD ( $30.09 \pm 21.65$  vs.  $12.51 \pm 16.61$ ,  $p<10^{-3}$ ). Severity of hyperactivity/impulsivity and IGD were moderately correlated ( $r=0.349$ ,  $p=0.013$ ), but the correlation disappeared after controlling for the impact on the social domain as measured by the ATENTO questionnaire ( $r=0.171$ ,  $p=0.250$ ). Most parents are concerned that their children may be addicted to IAD/IGD/MPA. Female gender is associated with MPA, while male gender is associated with IGD. ADHD is a risk factor for developing IAD and IGD. Combined type and predominantly hyperactive/impulsive ADHD are each associated with IGD. Good social adjustment protects against developing IGD. There are gender vulnerabilities for IAD/IGD/MPA. ADHD is a risk factor for IGD, but good social adjustment buffers this association.

**Keywords:** ADHD; Internet addiction disorder; Internet gaming disorder; mobile phone addiction.

### Resumen

El uso de las nuevas tecnologías se ha generalizado a nivel mundial. Hay una creciente preocupación respecto del «trastorno de adicción a Internet» (TAI), el «trastorno de juego en Internet» (TJI) y la «adicción al teléfono móvil» (ATM). El trastorno por déficit de atención con hiperactividad (TDAH) se ha asociado con el TAI y el TJI. Sin embargo, falta evidencia sobre la relación entre el TDAH y la ATM. Estudio naturalista de casos y controles. Comparación de 112 pacientes (51 niños con el TDAH y 61 niños sin el TDAH) con edades entre 7-17 años respecto del TAI, el TJI y la ATM. Utilizamos el cuestionario de TEA para evaluar la función ejecutiva y el TDAH (ATENTO) y el cuestionario ADITEC para obtener información diferenciada por género para el TAI, el TJI y la ATM. Las niñas obtuvieron puntuaciones más altas en la ATM (desviación típica  $\pm$  media,  $DT \pm M$ ) ( $25,93 \pm 17,64$  vs.  $14,77 \pm 19,43$ ,  $p = ,03$ ), mientras que los niños obtuvieron puntuaciones más altas en el TJI ( $30,09 \pm 21,65$  vs.  $12,51 \pm 16,61$ ,  $p < 10^{-3}$ ). Hubo una correlación moderada entre la gravedad de hiperactividad/impulsividad y el TJI ( $r = ,349$ ,  $p = ,013$ ), pero la correlación desapareció después de controlar por el impacto en el ámbito social según las mediciones del cuestionario ATENTO ( $r = 0,171$ ,  $p = ,250$ ). A la mayoría de los padres les preocupa que sus hijos puedan tener el TAI, el TJI o la ATM. El género femenino está asociado con la ATM, mientras que el género masculino está asociado con el TJI. El TDAH es un factor de riesgo para el desarrollo del TAI y el TJI. El TDAH del tipo combinado y de predominio de hiperactividad/impulsividad están asociados con el TJI. Un buen ajuste social protege contra el desarrollo del TJI. Hay vulnerabilidades de género para el TAI, el TJI y la ATM. El TDAH es un factor de riesgo para el TJI, pero un buen ajuste social amortigua esta asociación.

**Palabras clave:** TDAH; trastorno por adicción a Internet; trastorno de juego en Internet; adicción al teléfono móvil.

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The use of new technologies (NT) (Internet, mobile phones, or video games) has become widespread worldwide. NT are useful tools that facilitate communication and information-sharing and can be used for recreational purposes. However, excessive use of NT is increasingly becoming a matter of concern (Marín Vila, Carballo Crespo & Coloma Carmona, 2018). For instance, 25% of young people spend more than three hours a day watching TV or using the Internet, and 15% spend more than three hours playing video games on a school day (Weiss, Baer, Allan, Saran & Schibuk, 2011). Even if it's controversial (Weinstein, Yacov, Manning, Danon & Weizman, 2015), there is increasing evidence that "Internet addiction disorder" (IAD), "Internet gaming disorder" (IGD), and "Mobile phone addiction" (MPA) are behavioral addictions (Chóliz, 2010; Osborne et al., 2016; Rehbein, Kliem, Baier, Mossle & Petry, 2015). Indeed, the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) included "addiction to gambling with money on the Internet" in the chapter *Disorders related to substances and addictive disorders*. Furthermore, IAD and IGD were included as conditions for further study in Section 3 (Chen, Chen & Gau, 2015; Rehbein et al., 2015).

These are several risk factors for IAD, IGD and MPA. For instance, certain characteristics such as extraversion, disinhibition, narcissism, neuroticism, social anxiety, anxious attachment, and low self-esteem are associated with an increased risk of IAD (Peris, Maganto & Garaigordobil, 2018). IGD is associated with male gender (Schou Andreassen et al., 2016). MPA has been related to low self-esteem, social anxiety and interpersonal sensitivity (You, Zhang, Zhang, Xu & Chen, 2019).

Attention Deficit Hyperactivity Disorder (ADHD), the most frequent disorder in childhood and adolescence with a prevalence of 5.29% (range: 0.2%-27%) worldwide (Polanczyk, de Lima, Horta, Biederman & Rohde, 2007), has been associated with IAD (Dalbudak & Evren, 2014) and IGD (Weinstein & Weizman, 2012). Some studies reported no significant differences in the amount of time or frequency of play between children with and without ADHD, but rather a more severe addiction to IGD in children with ADHD (Bioulac, Arfi & Bouvard, 2008). However, there is less evidence concerning the relationship between ADHD and MPA.

The main aim of this study is to explore the relationship between ADHD and IAD, IGD, and MPA in children and adolescents. Our study has three specific objectives: first, to compare the pattern of NT use (Internet, video games, and mobile phone) among children and adolescents with and without ADHD; second, to study the relationship between ADHD, and IAD, IGD, and MPA; and third, to explore whether or not social skills mediate the relationship between ADHD, and IAD, IGD, and MPA.

## Methods

### Participants

Our study is a descriptive naturalistic case-control study. The sample was recruited at the Puerta de Hierro University Hospital in Majadahonda (HUPH-M). One hundred twelve patients between 7 and 17 years old were recruited: 51 children and adolescents diagnosed with ADHD (cases), and 61 children and adolescents who attended outpatient pediatrics consultations in the same hospital for a medical reason and without a diagnosis of ADHD (controls). Most controls were patients either for digestive or respiratory reasons. Neither the cases nor the controls presented comorbidity with mental retardation, generalized developmental disorders or other neurological or psychiatric alterations that could compromise the cognitive functioning of the participant.

### Measures and procedure

The cases and controls were evaluated using semi-structured diagnostic interviews, including parent interviews, and a protocol including sociodemographic and clinical data; the ADHD criteria of the Diagnostic and Statistical Manual of Mental Disorders, 4th ed. (DSM-IV); and some scales for assessing ADHD, and IAD, IGD, and MPA.

According to these criteria, cases were divided into the following groups: combined type (ADHD/C), predominantly hyperactive/impulsive type (ADHD/HI), and predominantly inattentive type (ADHD/I). To evaluate the main ADHD symptoms (impulsivity, hyperactivity and inattention) and the underlying executive processes altered, we used the *TEA questionnaire for the assessment of executive function and ADHD* (ATENTO), which evaluates the following aspects: attention control, behavioral regulation, emotional regulation, flexibility, working memory, planning and organization, temporal orientation, behavioral problems, sleep-related problems, as well as the level of affection or impact of symptoms in family, social and school contexts (Sánchez-Sánchez & Luque, 2020).

We evaluated the use of NT by using information provided by the parents and children. Participating parents filled out an ad hoc 12-item (yes/no) questionnaire based on an adapted version of the criteria used for the evaluation of behavioral addictions (Blasco-Fontecilla et al., 2014) (see supplementary material, SM). This strategy has been used elsewhere (Kourosh, Harrington & Adinoff, 2010). We used the first question of the ad hoc questionnaire evaluating the use of NT (*Do you think your child has an addiction to any of the following technologies?*). If the parent responded "yes" to three or more questions (items 2 to 12), we considered it a "screening diagnosis" for addiction to NT. Regarding children and adolescents, we used the ADITEC questionnaire (ADITEC. Assessment and Prevention of Internet, Mobile and Video Game Addiction, Choóiz, Marco & Chóliz, 2016) to diagnose IAD, IGD, and/or

MPA. The ADITEC questionnaire provides gender-differentiated information for IAD, IGD, and MPA, including a total score and the following subscale scores: 1) Internet (ADITEC-I): abuse, abstinence, disturbance and absence of control, and escape; 2) Video games (ADITEC-V): compulsive gambling, abstinence, tolerance and interference with other activities, and associated problems and escape; and 3) Mobile phone (ADITEC-M): tolerance and abstinence, difficulty controlling impulse, problems derived from economic expenditure and abuse (Chóliz, Marco & Chóliz, 2016).

### Statistical Analyses

For Objective 1, we performed descriptive analyses of sociodemographic and clinical variables and the frequency of addiction to NT in the case and control groups, using  $\chi^2$  and the odds ratio (OR) for ordinal and internal variables. We also used the *t* test for independent samples associated with the Levene statistic for equality of variances to compare quantitative variables (cases vs. controls, and ADHD/HI vs. ADHD/I). To assess group differences regarding IAD, IGD, and MPA, the bifactorial ANOVA procedure was conducted by differentiating two age groups: 7-11 years old and 12-17 years old. Therefore, we considered group (case-control) as a between-subjects factor, and IAD/IGD/MPA, as a within-subject factor. This strategy allowed us to extract information between groups, types of addiction to NT (IAD, IGD, and MPA), and the inter-

action between ADHD and IAD/IGD/MPA. For Objective 2, we performed bivariate correlation analyses comparing the scores of the three subscales of the ADITEC questionnaire (Mobile phone, Video games and Internet) and the scores of inattention and hyperactivity-impulsivity as measured by the ATENTO questionnaire. For Objective 3, we performed the same bivariate correlation analyses but controlled for the subscale Affection of the Social Context from the ATENTO questionnaire. The level of statistical significance was established at  $p < 0.05$ . We used the SPSS software (v20 for Mac) for all analyses.

### Ethics

The study procedures were carried out in accordance with the Declaration of Helsinki. The local Institutional Review Board approved the study (February 12, 2018; n° 03.18). Before entering the study, the study was explained to parents (or legal guardians) and children. Informed Consent (IC) was obtained from both. Both the parents (or legal guardians) and the children were fully informed and agreed to participate voluntarily.

### Results

Table 1 displays the participants' sociodemographic and educational characteristics, and some clinical and familial antecedents.

Table 1. Patient sociodemographic and clinical characteristics.

	Cases n = 51 %	Controls n = 61 %	OR [95% CI]	Significance
Gender (female)	21.6	49.2	0.48 [0.28-0.82]	FET* p = .003
Adopted (Yes)	15.7	0.0	2.42 [1.92-3.04]	FET p = .001
Repeating at least one school year	28	9.8	1.77 [1.20-2.60]	FET p = .024
Teaching support at school (Yes)	37.5	13.1	1.92 [1.31-2.81]	FET p = .006
Adapting early childhood curriculum at school (Yes)	31.2	9.8	1.91 [1.30-2.79]	FET p = .007
Teaching support at home (Yes)	39.6	24.6		FET p = .101
Problems during pregnancy (Yes)	23.8	18		FET p = .619
Childbirth (weeks)				FET p = .841
< 37 o > 42	34.6	31.1		
37-42	65.4	68.9		
Problems during childbirth (Yes)	20.9	29.5		FET p = .370
Speech Acquisition (> 2 years old)	48.1	29.5	1.52 [1.02-2.22]	FET p = .053
Sphincter control (> 6 years old)	25	6.6	1.88 [1.32-2.69]	FET p = .008
Familial antecedents of mental disorders	47.1	11.7	2.17 [1.59-3.33]	FET p < 10-3

Note. \* FET (Fisher Exact Test)



### Objective 1: To compare the pattern of NT (internet, video games and mobile phone) use in cases versus controls

The first question of the ad hoc questionnaire evaluating the use of NT (*Do you think your child has an addiction to any of the following technologies?*) was affirmatively answered by 75.6% and 73% of the parents of cases and controls, respectively. Even if we did not find statistically significant differences regarding the use of internet/videogames/mobile phone, parents of children and adolescents with ADHD seemed particularly worried about Internet use, whereas the parents of controls expressed their concerns about mobile phone use (see Table 1-SM).

When using the operational diagnosis of addiction to NT (3 or more affirmative responses to questions 2-12), 66.7% and 29.7% of the parents of ADHD and control cases, respectively, met the diagnostic criteria [OR(95%) = 2(1.28-3.12), Fisher Exact Test (FET)  $p = 0.002$ ] (see Figure 1-SM and Table 2-SM).

Figure 1 graphically displays the prevalence of at least one addiction to NT (IAD/IGD/MPA). The prevalence ranges between the 29.7% among pediatric controls and the 100% of the predominantly ADHD/HI subtype (OR = 3.42 [1.23-9.55], FET  $p = 0.003$ ).

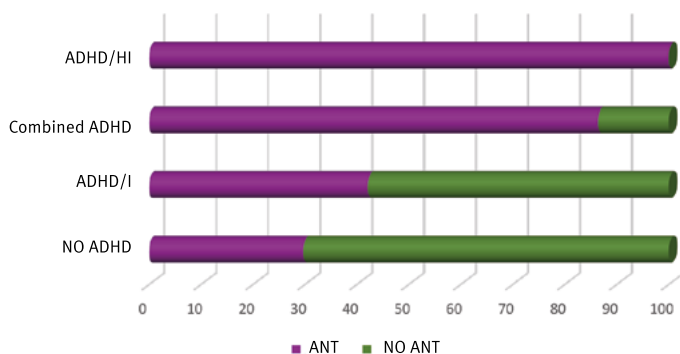


Figure 1. Prevalence of at least one "addiction to NT" (ANT): IAD/IGD/MPA.

ADHD was associated with IAD and IGD, but not with MPA (see Table 2).

Table 2. Comparison between cases and controls regarding IAD, IGD, and MPA (as measured by the ADITEC).

	Cases (n = 51)	Controls (n = 61)		
	M ± DT	M ± DT	Levene	t Test
ATM	18.86 ± 19.20	19.15 ± 19.77	0.794	$p = .939$
TJI	32.10 ± 23.70	16.79 ± 16.89	0.001	$p < .001$
TAI	26.94 ± 21.18	17.70 ± 17.23	0.079	$p = .013$

Figure 2 shows the quantitative differences among IAD/IGD/MPA (as measured by the direct responses on the ADITEC) regarding gender. Female children scored higher on MPA (Mean Standard Deviation, M SD) (25.93 17.64 vs. 14.77 19.43,  $p = 0.03$ ) and IAD (23.59 18.72 vs. 20.68

20.22,  $p = 0.45$ ), while male children scored higher on IGD (30.09 21.65 vs. 12.51 16.61,  $p < 10^{-3}$ ).

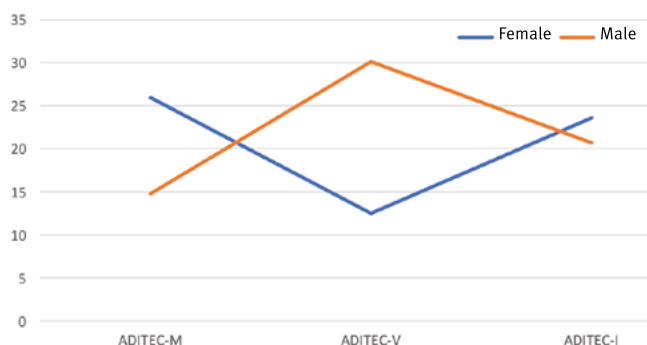


Figure 2. Type of ANT (as measured by the ADITEC\*): IAD/IGD/MPA by gender.

Note. \*ADITEC-M (Mobile); ADITEC-V (Video games); ADITEC-I (Internet).

### Objective 2: To study the relationship between ADHD and ANT

Table 3 displays the relationship between the various subtypes of ADHD and IAD/IGD/MPA.

Table 3. Subtypes of ADHD (DSM-IV) and IAD/IGD/MPA (as measured by the ADITEC\*).

	TDAH/I (n = 24)	TDAH/HI o el TDAH/C (n = 26)		
	M ± DT	M ± DT	Levene	t Test
ATM	22.75 ± 19.25	14.73 ± 18.88	0.794	$p = .144$
TJI	22.79 ± 18.91	40.31 ± 25.25	0.201	$p = .008$
TAI	27.13 ± 22.33	26.75 ± 20.91	0.865	$p = .952$

We found a positive correlation between the severity of impulsivity and IGD (see Table 4). Accordingly, we explored which of the IGD subscales were involved. We found that the severity of H/I correlated with both the abstinence and the associated problems and escape subscales (see Table 5).

Table 4. Correlations between ADHD dimensions (as measured by ATENTO) and IAD/IGD/MPA (as measured by the ADITEC).

		ATM	TJI	TAI
Inattention	Pearson r	-.145	.219	.007
	Significance	.316	.127	.961
Hyperactivity/ Impulsivity	r de Pearson	-.079	.349	.066
	Significance	.586	.013	.657

Table 5. Correlations between ADHD dimensions (as measured by ATENTO) and IGD's subscales.

		Compulsive gambling	Absti- nence	Tolerance & interfe- rence	Associated problems & escape
Inattention	Pearson r	.164	.219	.211	.239
	Significance	.254	.126	.142	.095
Hyperactivity/ Impulsivity	Pearson r	.273	.373	.257	.405
	Significance	.056	.008	.072	.004

### Objective 3: To test the influence of the social context on the ANT

After controlling for the impact of the social domain as measured by the ATENTO questionnaire, the correlations displayed in Table 6 were lower than those displayed in Table 4 and were no longer statistically significant.

Table 6. Correlations between ADHD and IAD/IGD/MPA controlling by the subscale Affection of the Social Context (ATENTO).

		ADITEC-M	ADITEC-V	ADITEC-I
Inattention	Pearson r	.005	-.074	-.184
	Significance	.972	.619	.217
Hyperactivity/ Impulsivity	Pearson r	.051	.171	-.063
	Significance	.734	.250	.674

## Discussion

In keeping with the literature, our study confirmed that addiction to NT (IAD/IGD/MPA) is highly prevalent among children and adolescents with and without ADHD. We also found that ADHD is associated with IAD/IGD/MPA in a Spanish population of children and adolescents. The association between ADHD and IAD/IGD/MPA has been convincingly demonstrated in several Asian countries (Lee et al., 2018), but evidence is lacking in other countries worldwide. Furthermore, we expanded on some information about the relationship between ADHD and IAD/IGD/MPA. For instance, we found that ADHD/C and ADHD/HI were associated with IGD, whereas ADHD/I was related to MPA. However, the most relevant finding was that good social adjustment buffered the relationship between ADHD/C or ADHD/HI, and IGD in children and adolescents with ADHD.

When using our ad hoc criteria for diagnosing an addiction to NT, we found that most of the parents of children and adolescents with or without ADHD feared that they might have at least one addiction to NT (IAD/IGD/MPA). These elevated percentages may suggest that the threshold used (3 items) was too low for using these criteria as a screening tool. In any case, the probability of presenting with IAD/IGD/MPA is very high. Thus, IAD ranges from 1.4% to 17.9% of adolescents (Chen et al., 2015), rising to 21.6% in Korea (Lee et al., 2018). Furthermore, 8% of people aged 17 or younger are diagnosed with IGD (Stockdale et al., 2018); 36.6% of adults with ADHD and 23% of controls without ADHD had at least one addiction to NT (Bielefeld et al., 2017).

On the other hand, we found a significant statistical difference between cases and controls concerning gender, as male gender was overrepresented among the ADHD group. Indeed, we found a male:female ratio of 3:1, which is the male:female ratio accepted in the literature (Lange, Reichl, Lange, Tucha & Tucha, 2010). It is important to stress this gender difference, as it may affect our results. Indeed, female and male gender were associated with MPA

and IGD, respectively (Haghbin, Shaterian, Hosseinzadeh & Griffiths, 2013; Schou Andreassen et al., 2016). These gender differences may reflect the propensity for males to engage in competitive and aggressive entertainment and for females to participate in cooperative and social activities (Griffiths, Kuss & Pontes, 2016).

In accordance with the literature, we found that ADHD is a risk factor for IAD (Dalbudak & Evren, 2014) and IGD (Weinstein & Weizman, 2012), but not MPA. Our findings are particularly interesting, because IAD was not associated with any particular subtype of ADHD, but IGD was clearly associated with ADHD/C and ADHD/HI. Most authors have reported that impulsivity is core to the addiction to NT. In a study, the most relevant predictor of developing IAD was impulsivity (Metin et al., 2015). These authors stressed that children most likely to present with IAD share a preference for quick response stimuli and short-term rewards, disinhibition and lack of self-control, and impulsivity. This opinion, paired with the evidence that individuals with IAD have deficits in inhibiting responses to stimuli under experimental conditions (Cao, Su, Liu & Gao, 2007), has led some authors to propose IAD as an impulse control disorder (Cao et al., 2007; Metin et al., 2015). Furthermore, a recent meta-analysis concluded that impulsivity mediated the relationship between ADHD and the addiction to media (Nikkelen, Valkenburg, Huizinga & Bushman, 2014).

Our finding that ADHD/HI and ADHD/C are the subtypes more closely associated with IGD is consistent with a study postulating that impulsivity explains the relationship between self-control, ADHD, and IGD (Haghbin et al., 2013). Indeed, individuals with IGD have similar neurocognitive and social cognitive dysfunctions as methamphetamine-dependent patients (Jiang, Li, Zhou & Zhou, 2020). Moreover, video games provide quick, immediate rewards and an artificial living environment where children and adolescents can escape from problems and fulfill their fantasies (Gentile, Swing, Lim & Khoo, 2012). Furthermore, severity of H/I is correlated with both abstinence and the associated problems and escape subscales. This finding is relevant because it points to specific areas of addiction that could be specifically targeted for treatment if our findings are replicated. We have not found any literature on this subject. We also found a trend of a clinically relevant association between ADHD/I and MPA. This finding is similar to the one reported in a study carried out with ADHD/I Chinese adolescents, who were particularly vulnerable to developing MPA if the mobile phone was switched on during sleep (Zheng et al., 2014).

However, the most important finding is that good social adjustment buffered the relationship between ADHD/C or ADHD/HI. This finding is important because research on the impact of computer and video game use on the development of children and adolescent social skills is scarce (Tran & Subrahmanyam, 2013). Thus, we must face the chicken

and egg dilemma: Does IGD worsen social skills? Or do people with poor social skills tend to use video games? Or can both hypotheses be true? In a case-control study, students with IGD had poorer social skills than students without IGD (Zamani, Kheradmand, Cheshmi, Abedi & Hedayati, 2010). In a longitudinal study, a two-year follow-up of 251 toddlers measured the impact of screen time (television/video, video/computer games) and physical activity on the development of social skills. They reported that screen time was negatively associated with express (e.g., joins play) and comply (e.g., cooperates) scores and positively associated with disrupt scores (e.g., teases) (Carson et al., 2019). In a similar vein, in another study the authors reported an inverse relationship between physical activity (fitness and bodybuilding) and video gaming-related self-regulation problems (Cardol, Escamilla, Gebhardt & Perales, 2019).

On the other hand, the self-medication hypothesis may help to explain why people lacking social skills make massive use of video games. In a study with 62 children, drug-naïve, diagnosed with ADHD, and Internet video game players, the authors reported that after eight weeks of treatment with methylphenidate, the children not only improved their ADHD symptoms but also reduced the time spent on Internet video gaming activities (Han et al., 2009). The authors reminded that both stimulants—such as methylphenidate—given to treat ADHD, and video game play increase synaptic dopamine, and suggested that “Internet video game playing might be a means of self-medication for children with ADHD”. Indeed, although the influence on children’s mental health is usually negatively perceived, a recent study with 3195 children aged 6-11 years old from six European countries reported that high video game use was related to 1.75 times the odds of high intellectual functioning, and a decreased risk of peer relationship problems and prosocial deficits [OR 0.41 (0.2-0.86) and 0.23 (0.07, 0.81), respectively] (Kovess-Masfety et al., 2016). In a randomized trial with 69 children aged 7-11 years with poor social skills, 33 were assigned to treatment with an interactive online adventure game for nine weeks, and 36 to a waitlist. The treatment group improved significantly more than the controls “in social literacy, social anxiety, bullying victimization, and social satisfaction” (Sánchez, Brown, Kocher & DeRosier, 2017). The authors concluded that video games may be useful in improving the mental health of children with poor social skills. Accordingly, they could be helpful in children and adolescents with or without ADHD who struggle with poor social skills.

Some limitations should be mentioned. Firstly, our study is retrospective. Accordingly, remember that bias may affect our results and that establishing causal links is not possible. Secondly, our sample size meant that some clinically significant results (e.g., the trend for parents of children with ADHD to be more worried about Internet use than parents of controls) did not reach statistical significance. Another limitation is that the control group was extracted from pa-

tients attending a pediatric consultation. Thus, the epidemiological results may not be representative of the general population of children and adolescents in our country. Another limitation is that we used an ad hoc questionnaire with parents to evaluate the perception of use of NT by their children; the questionnaire was based on modified DSM-IV-TR criteria for substance dependence. However, this strategy has been used for evaluating other behavioral addictions, such as suicidal behavior or tanning (Blasco-Fontecilla et al., 2014; Kourosh et al., 2010). Finally, we used brand-new questionnaires only available in Spanish for evaluating the severity of ADHD and the addiction to NT (ATENTO and ADITEC, respectively). However, the ATENTO questionnaire is particularly interesting because it evaluates not only the core ADHD clinical symptoms but also executive function and the impact of ADHD symptoms in several domains, including the social area. Despite being novel, the ADITEC questionnaire expands on information regarding various aspects of addictive behaviors and may help in expanding our knowledge of specific areas (e.g., impulsivity, tolerance) that are altered in IAD, IGD, and MPA. Furthermore, the ADITEC comprehensively evaluates IAD, IGD, and MPA in a single questionnaire.

## Conclusions

Most parents are concerned that their children may be addicted to NT (IAD/IGD/MPA). Female gender is associated with MPA, while male gender is associated with IGD. ADHD is a risk factor for developing IAD and IGD. ADHD/C and ADHD/HI are each associated with IGD. Good social adjustment protects against developing IGD. Future directions for research may include, among others: 1) the study of good social adjustment as a protective factor against developing an IGD; 2) testing if either the use of sports or some video games may be protective for developing an IGD; and 3) the study of how some characteristics of the video games (i.e., the amount of time, frequency of play, presence or absence of violence, etc.) interact with the personality characteristics and gender of children and adolescents (López-Fernández, Mezquita, Griffiths, Ortet & Ibáñez, 2021), so we can develop preventive rules aimed at protecting vulnerable children and adolescents.

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## Conflict of interests

In the last 24 months, Hilario Blasco-Fontecilla received lecture fees from Shire. He is Principal Investigator (PI) of an iPFIS research contract (www.isciii.es; IFI16/00039) and

co-PI of a MINECO research grant (RTI2018-101857-B-I00); recipient of: 1) a FIPSE Grant, and 2) an IDIPHPSA intensification Grant; involved in two clinical trials (MENSIA KOALA, NEWROFEED Study; ESKETSUI2002); member of the Advisory Board of ITA Salud Mental. Fernando Sánchez Sánchez is an employee of *TEA ediciones*. Maria Rodrigo Yanguas is the recipient of an iPFS research contract (www.isciii.es). The remaining authors do not have any conflict of interest regarding the publication of this manuscript.

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Neither financial support nor indirect sponsorship was received for this study.

## Authors' contributions

All authors have participated sufficiently in the work to take public responsibility for the content. The corresponding author affirms that he had access to all data from the study, both what is reported and what is unreported, and also had complete freedom to direct its analysis and reporting.

H.B.F. conceived and designed the study. A.M. and A.J.A. gathered all clinical and protocol data. M.R.Y. designed the database and entered most of the data.

H.B.F. and A.M. are responsible for data analyses, literature searches, draft and revision of the manuscript's initial versions.

F.S.S., E.R.R., and M.M.V. reviewed the manuscript and provided conceptual guidance for improving the study.

All authors read, critically revised and approved the final version of the manuscript; no other potential authors have been omitted from authorship.

## Ethics

The Institutional Review Board of the Puerta de Hierro University Hospital-Majadahonda approved the study (February 12, 2018; n° 03.18).

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## Supplementary material (SM)

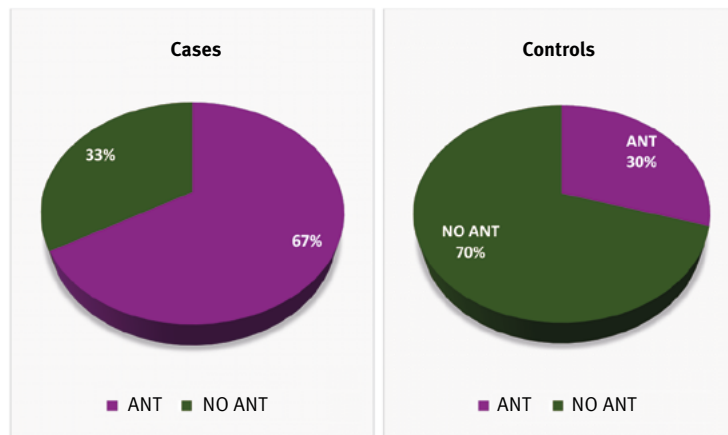


Figure 1-SM. Prevalence of an addiction to new technology (ANT: IAD, IGD, and/or MPA) among cases and controls.

Table 1-SM. Perception of an ANT by parents (responses to question 1 of the ad hoc questionnaire).

	No	Mobile	Video games	Internet	Several	Global
Cases	11 (24.4%)	6 (13.1%)	14 (31.1%)	12 (26.7%)	2 (4.4%)	45 (100%)
Controls	10 (27%)	9 (24.3%)	12 (32.4%)	5 (13.5%)	1 (2.7%)	37 (100%)
Global	21 (25.6%)	15 (18.3%)	26 (31.7%)	17 (20.7%)	3 (3.7%)	82 (100%)

Table 2-SM. Ad hoc questionnaire about a putative ANT (parents).

Item	Cases (%)	Controls (%)	Significance
1. Do you think your child has an addiction to any of the following technologies?			ns
2. Has your child got the urge to use new technologies (mobile, video games, or the Internet) to relieve tension, relax, or decrease psychological distress in the past year?			ns
3. Has your child been using new technologies more frequently or longer lasting than initially planned?			ns
4. Does your child have a persistent desire to quit the use of new technologies, but is unable to stop?			ns
5. Has your child ever missed or reduced a social engagement, work, school, or other recreational activities because he/she was involved in activities related to new technologies?	46.7	21.6	p = .018
6. Does your child continue using new technologies despite knowing the problems related to its use?			ns
7. Has your child tried to stop using new technologies, but is unable to do so or it took him/her a lot of effort?			ns
8. Do you feel that your child needs to spend more and more time on new technologies in order to feel good, less anxious, or emotionally fine?	44.4	2.7	p < .05
9. Does your child feel a strong desire to use new technologies even without any particular reason?	64.4	16.2	p < .05
10. Has your child gotten into trouble at school/work/home due to new technologies?	42.2	0	p < .05
11. Does your child use new technologies in situations in which it is physically hazardous? (i.e., crossing a road while using mobile phone)	22.2	0	p < .05
12. Does your child feel bad, anxious or annoyed when he/she wishes to use new technologies but cannot do so at the time?			ns



# The Multi-Component Smoking Cessation Support Programme (McSCSP) is effective in patients with severe mental disorder without gender differences

***El programa multicomponente de apoyo para el cese del tabaquismo (McSCSP) es efectivo en pacientes con trastorno mental grave sin diferencias de género***

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# Abstract

High prevalence of smoking in people with severe mental disorders (SMD) contributes to their medical morbidity and reduced life expectancy. Despite the evidence of gender differences in smoking cessation, few studies have tested those differences among people with SMD. This is a non-randomized, open-label, prospective, 9-month follow-up multicentre trial to examine gender differences in the efficacy, safety and tolerability of a Multi-Component Smoking Cessation Support Programme (McSCSP). The results showed that there were no significant differences in short- (males 44.9% vs females 57.7%, *chi-square* = 1.112, *p* = 0.292) or long-term efficacy (week 24: males 40.8%, females 42.3%, *chi-square* = 0.016, *p* = 0.901; week 36: males 36.7%, females 38.5%, *chi-square* = 0.022, *p* = 0.883) between

## Resumen

La elevada prevalencia del tabaquismo en personas con trastorno mental grave (TMG) contribuye a su morbilidad médica y reduce su esperanza de vida. A pesar de la existencia de diferencias de género en el cese del tabaquismo, pocos estudios han evaluado esas diferencias en personas con TMG. Este es un ensayo multicéntrico de seguimiento prospectivo, no aleatorio, abierto de 9 meses para examinar las diferencias de género en la eficacia, seguridad y tolerabilidad de un programa multicomponente de apoyo para el cese del tabaquismo (McSCSP). Los resultados mostraron que no hubo diferencias de género significativas en la eficacia a corto (hombres 44,9% vs mujeres 57,7%, chi cuadrado = 1,112,  $p = .292$ ) ni a largo plazo (semana 24: hombres 40,8%, mujeres 42,0,3%, chi cuadrado = 0,016,  $p = .901$ ; semana 36: hombres 36,7%, mujeres 38,5%.

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gender, neither controlled by diagnosis or treatment. Regarding safety and tolerability, there was significant increase in abdominal perimeter in males [from 105.98 (SD 13.28) to 108.52 (SD 14.01),  $t = -3.436$ ,  $p = 0.002$ ], but not in females. However, there were no significant gender differences in adverse events (constipation, abnormal/vivid dreams, nausea/vomiting or skin rash/redness around patch site). In conclusion, we have demonstrated that is effective and safe to help either male or female patients with stabilized SMD to quit smoking. However, it might be a tendency in females to respond better to varenicline treatment in the short term. Future research with larger samples is required to more clearly determine whether or not there are differences, in addition to their reliability and robustness.

**Keywords:** Gender differences; smoking cessation; schizophrenia; bipolar disorder; varenicline; transdermal nicotine patches.

chi cuadrado = 0,022,  $p = ,883$ ), incluso controlando por diagnóstico o tratamiento. Con respecto a la seguridad y la tolerabilidad, hubo un aumento significativo en el perímetro abdominal en los hombres [de 105,98 (DT 13,28) a 108,52 (DT 14,01),  $t = -3,436$ ,  $p = ,002$ ], pero no en las mujeres. Sin embargo, no hubo diferencias de género significativas en los eventos adversos (estreñimiento, sueños anormales/vívidos, náuseas/vómitos o erupción cutánea/enrojecimiento alrededor de la zona del parche). En conclusión, hemos demostrado que es efectivo y seguro ayudar a los hombres y mujeres con TMG estabilizados a dejar de fumar. Sin embargo, podría haber una tendencia en las mujeres a responder mejor al tratamiento con vareniclina a corto plazo. Se requiere investigación futura con muestras más amplias para determinar con más claridad la existencia de diferencias, además de la fiabilidad y robustez.

**Palabras clave:** Diferencias de género; cese del tabaquismo; esquizofrenia; trastorno bipolar; vareniclina; parches transdérmicos de nicotina.

In people with severe mental disorders (SMD) and other disorders the smoking estimated prevalence is between 50-80% and 54-68% for schizophrenia and bipolar disorder, respectively (De Hert et al., 2011; Jiménez-Treviño et al., 2019; Rodríguez Muñoz, Carmo-na Torres, Hidalgo Lopezosa, Cobo Cuenca & Rodríguez Borrego, 2019). In some countries, the smoking rates are similar between men and women with psychotic disorders, in others like Asia females with schizophrenia are less likely to be current smokers than males (Hahn, Rigby & Galletly, 2014; Kim et al., 2013). The multi-component treatment in a clinical settings has demonstrated the importance of the motivation level in the preparation phase (Garcia-Portilla et al., 2016; Sarramea Crespo et al., 2019a; Sarramea et al., 2019b).

Research examining gender differences in smoking cessation outcomes have found some differences between males and females in the general population. Females are less likely to use nicotine replacement therapy (NRT) (Perkins, 2001), tend to have more difficulty quitting (Perkins, 2001; Reid, Pipe, Riley & Sorensen, 2009; Walker et al., 2016) and have poorer smoking-cessation treatment outcomes in large population-based treatment trials (Bjornson et al., 1995; COMMIT, 1995) with Bupropion (Scharf & Shiftman, 2004) or NRT (Davis et al., 1994; Perkins & Scott, 2008; Wetter et al., 1999). However, the unique report in patients with psychosis did not find gender differences in those variables (Filia et al., 2014). Thus, research on this topic is needed in order to determinate which programs could be more effective in each gender.

The aim of this study was to examine gender differences in the efficacy, safety and tolerability of a Multi-Component Smoking Cessation Support Programme (McSCSP) (Garcia-Portilla et al., 2014, 2016) specifically designed for the treatment of patients with SMD under real-world clinical conditions.

## Methods

### Study design

This is a non-randomized, open-label, prospective, 9-month follow-up, multicenter study, conducted at 3 sites in Spain (Oviedo, Jaén and Vitoria) between March 2011 and June 2013 (see Garcia-Portilla et al., 2014, 2016). The Clinical Research Ethics Committee of Hospital in Oviedo approved the study protocol (Ref. 64/2010).

The McSCSP consisted of 2 phases: phase 1, before the active treatment phase, a weekly individual motivational therapy for 4 to 12 weeks; phase 2, a 12-week active treatment phase. During the active treatment phase patients received the medication and an intensive 12-week manualized group therapy on issues relevant for these patients. The choice of the pharmacological treatment for each patient was a shared decision between the clinician and the patient (for more details see Garcia-Portilla et al., 2014).

### Subjects

Subjects were outpatients with a diagnosis of severe mental disorder who were clinically stable and attended their scheduled appointments. During those appoint-

ments, their psychiatrists gave them the possibility to take part in a study for smoking cessation.

Inclusion criteria: DSM-IV diagnosis of schizophrenia, schizoaffective or bipolar disorder; currently smoking  $\geq 15$  cigarettes/day; Fagerström Test for Nicotine Dependence score  $\geq 4$ ; breath CO  $> 9$  ppm; 18-65 years; no suicidal ideation; and written informed consent.

Exclusion criteria: PANSS total score  $>70$  (schizophrenia), or HDRS score  $>14$  or YMRS  $>6$  (bipolar disorder); serious suicidal behavior/thoughts in the last 6 months; severe unstable somatic illness; organic brain damage; renal impairment (creatinine  $\geq 1.5$  mg/dL); and liver function impairment (twice the normal upper limit).

### Assessments

All subjects were assessed at baseline, during the 12-week active treatment phase, and at weeks 12 and 24 of the post-treatment follow-up phase. They were classified into three categories according to the self-reported number of cigarettes smoked per day (CPD): light (CPD  $\leq 10$ ), moderate (between 11 and 20), and heavy smokers ( $>20$ ). For more details about assessment see Garcia-Portilla et al., (2014, 2016).

### Outcome measures and statistical analyses

The week 12 primary outcome measures were gender differences in smoking cessation (previous 7-days self-reported abstinence confirmed by breath CO levels  $\leq 9$  ppm) and in the proportion of subjects with at least a 50% reduction in the number of cigarettes per day (CPD) over the last 7 days. Secondary outcome measures were gender differences in safety, including changes in the symptoms of the primary illness and suicide attempts, and tolerability.

The SPSS 17.0 was used and the level of significance was 0.05. All analyses were performed according to an intention-to-treat approach. For dealing with missing data

the last observation carried forward (LOCF) method was employed. The chi-square test, Student's t-test, and paired t-test were used to determine statistically significant differences between genders and to test for changes over time between baseline and week 12.

A mixed between-within subject analysis of variance was conducted to assess the impact of the two genders on patient smoking and clinical variables over four time periods (baseline, the 12-week active treatment phase, and at weeks 12 and 24 of the post-treatment follow-up phase).

## Results

Out of 82 enrolled patients 75 were analyzed [(36 transdermal nicotine patch (TNP), and 39 varenicline; 72% schizophrenia/schizoaffective and 28% bipolar disorder; 65.3% males, 34.7% females (*chi-square*=4.041, *p*=0.044)]. The retention rates in the study were 61.3% (67.3% males, 53.8% females, *chi-square* = 1.323, *p* = 0.250) at week 12, 48% (49.0% males, 46.2% females, *chi-square* = 0.054, *p* = 0.816) at week 24 and 46.6% (46.9% males, 46.2% females, *chi-square* = 0.004, *p* = 0.948) at week 36. There were no statistically significant differences in the retention rates among gender neither among gender and treatments. Baseline descriptive analysis is shown in Table 1.

### Efficacy

Figure 1 shows the short- and long-term efficacy for males and females. There were no significant differences in short or long-term efficacy between genders, diagnosis or treatments. Furthermore, the interaction effect between time and gender was not significant for any of the variables (Table 2).

Table 1. Patient demographic and baseline clinical and smoking characteristics for the total sample and for male and female patients separately.

	Total sample n= 75	Males n= 49	Females n= 26	Statistical test, <i>p</i>
Mean age (sd)	45.3 (9.0)	44.1 (9.7)	47.8 (7.2)	2.957 <sup>d</sup> , 0.090
Civil status [n (%)]				17.635 <sup>e</sup> , <0.0001
Never married	47 (62.7)	39 (79.6)	8 (30.8)	
Married or living as married	16 (21.3)	5 (10.2)	11 (42.3)	
Widowed or separated/divorced	12 (16.0)	5 (10.2)	7 (26.9)	
Educational level [n (%)]				2.500 <sup>e</sup> , 0.287
Primary school	32 (42.7)	18 (36.7)	14 (53.8)	
Secondary school	32 (42.7)	24 (49.0)	8 (30.8)	
University	11 (14.7)	7 (14.3)	4 (15.4)	
Work status [n (%)]				6.043 <sup>e</sup> , 0.110
Working (full / part-time)	7 (9.3)	5 (10.2)	2 (7.7)	
Disabled (temporary / permanent)	33 (44.0)	26 (53.1)	7 (26.9)	
Illness benefit	19 (25.3)	9 (18.4)	10 (38.5)	
Other <sup>a</sup>	16 (21.3)	9 (18.4)	7 (26.9)	

Table 1 (cont.). Patient demographic and baseline clinical and smoking characteristics for the total sample and for male and female patients separately.

	Total sample n= 75	Males n= 49	Females n= 26	Statistical test, <i>p</i>
Diagnosis [n (%)]				4.041 <sup>e</sup> , 0.044
Schizophrenia	54 (72.0)	39 (79.6)	15 (57.7)	
Bipolar	21 (28.0)	10 (20.4)	11 (42.3)	
Length of illness, months [Mean (sd)]	209.2 (125.4)	201.8 (127.1)	223.2 (123.5)	0.004 <sup>d</sup> , 0.950
First episode, yes [n (%)]	10 (13.5)	5 (10.4)	5 (19.2)	1.121 <sup>e</sup> , 0.290
Comorbid SUD [n (%)]	10 (13.3)	7 (14.3)	3 (11.5)	0.111 <sup>e</sup> , 0.739
Suicidal attempts				
Yes [n (%)]	29 (38.7)	15 (30.6)	14 (53.8)	3.867 <sup>e</sup> , 0.049
Mean number (sd)	2.8 (1.8)	2.6 (1.2)	2.9 (2.3)	3.992 <sup>d</sup> , 0.056
CGI-S [Mean (sd)]	3.5 (1.0)	3.6 (1.0)	3.5 (1.0)	0.022 <sup>d</sup> , 0.884
PANSS <sup>b</sup> [Mean (sd)]				
Positive	11.4 (3.8)	11.5 (3.8)	11.1 (4.0)	0.020 <sup>d</sup> , 0.887
Negative	14.9 (5.6)	15.1 (5.0)	14.4 (7.1)	0.920 <sup>d</sup> , 0.342
General psychopathology	27.2 (8.2)	26.3 (5.9)	29.5 (12.4)	2.326 <sup>d</sup> , 0.133
Total	52.2 (11.4)	52.9 (11.1)	50.3 (12.4)	0.146 <sup>d</sup> , 0.704
HDRS <sup>c</sup> [Mean (sd)]	5.1 (4.0)	5.6 (4.3)	4.6 (3.8)	0.322 <sup>d</sup> , 0.577
YMRS <sup>c</sup> [Mean (sd)]	2.9 (2.5)	1.9 (2.7)	3.7 (2.1)	1.095 <sup>d</sup> , 0.308
Self-reported CPD [Mean (sd)]	30.1 (11.8)	31.4 (12.7)	27.7 (9.8)	2.111 <sup>d</sup> , 0.150
Smoking status				0.687 <sup>e</sup> , 0.407
Moderate (self-reported CPD 11-20)	27 (36.0)	16 (32.7)	11 (42.3)	
Heavy (self-reported CPD >20)	48 (64.0)	33 (67.3)	15 (57.7)	
Breath CO levels	27.3 (18.3)	30.0 (20.6)	22.1 (11.4)	4.636 <sup>d</sup> , 0.035
FTND score	6.3 (2.6)	6.1 (2.7)	6.7 (2.4)	0.484 <sup>d</sup> , 0.489
G-NSBQ score	17.8 (6.9)	17.6 (7.3)	18.2 (6.0)	0.405 <sup>d</sup> , 0.526
Treatment				0.517 <sup>e</sup> , 0.472
TNP	36 (48.0)	25 (51.0)	11 (42.3)	
Varenicline	39 (52.0)	24 (49.0)	15 (57.7)	

Note. CGI-S: Clinical Global Impression - Severity; CO: carbon monoxide; CPD: cigarettes per day; FTND: Fagerström Test for Nicotine Dependence; GN-SBQ: Glover-Nielsen Smoking Behavioral Questionnaire; HDRS: Hamilton Depression Rating Scale; PANSS: Positive and Negative Syndrome Scale; sd: standard deviation; SUD: substance use disorder; TNP: transdermal nicotine patch; YMRS: Young Mania Rating Scale.

<sup>a</sup> Other includes: unemployed, housewife, student and retired.

<sup>b</sup> Data for PANSS are from patients with schizophrenia (n= 54).

<sup>c</sup> Data for HDRS and YMRS are from patients with bipolar disorder (n= 21).

<sup>d</sup> Student's t-test.

<sup>e</sup> Chi-square test.

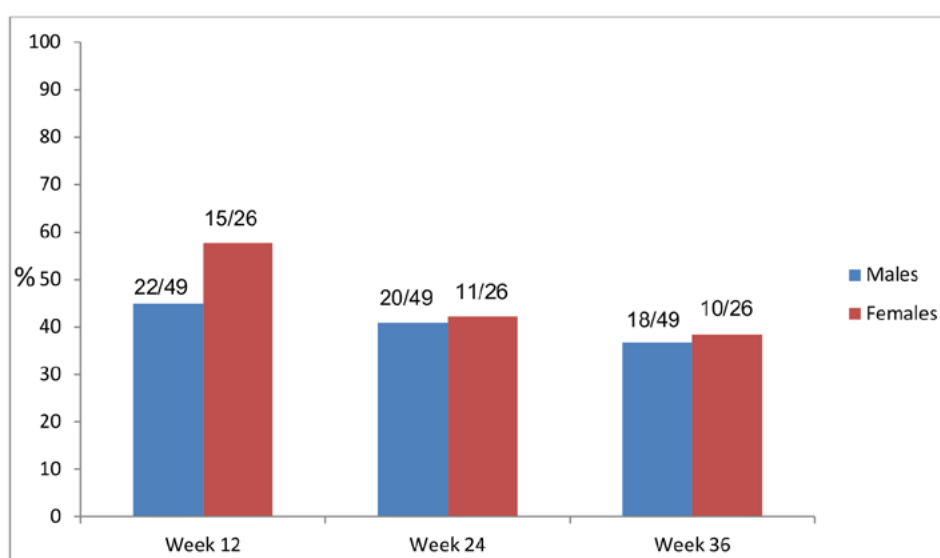


Figure 1. Short- and Long-term efficacy<sup>a</sup> for males and females.

Note. There were no statistically significant differences in efficacy rates between males and females at any time period.

<sup>a</sup> Patient's self-report of previous 7-day abstinence confirmed by breath CO levels  $\leq 9$  ppm.

Table 2. *Smoking characteristics for males and females across four time periods.*

	Males				Females			
	Baseline	W12	W24	W36	Baseline	W12	W24	W36
[mean (sd)]								
CPD	31.4 (12.7)	6.8 (8.7)	9.6 (10.5)	9.1 (9.0)	27.7 (9.8)	7.9 (12.3)	10.4 (12.2)	10.3 (12.4)
Breath CO level	30.0 (20.6)	12.4 (14.6)	13.6 (14.7)	14.4 (15.6)	22.1 (11.4)	9.2 (12.6)	11.9 (13.2)	12.2 (12.0)
FTND scores	6.1 (2.7)	2.6 (3.1)	2.8 (3.1)	3.2 (3.0)	6.7 (2.4)	2.2 (3.1)	2.9 (3.5)	3.2 (3.4)
GN-SBQ scores	17.6 (7.3)	9.0 (8.9)	9.2 (9.1)	9.7 (9.8)	18.2 (6.0)	7.5 (7.7)	9.4 (8.8)	10.2 (7.8)
Smoking <sup>a</sup> [n (%)]								
Abstinent		24 (49.0)	21 (42.9)	18 (38.8)		16 (61.5)	12 (46.2)	12 (46.2)
Mild		10 (20.4)	6 (12.2)	10 (20.4)		2 (7.7)	3 (11.5)	4 (15.4)
Moderate	16 (32.7)	12 (24.5)	16 (32.7)	17 (34.7)	11 (42.3)	4 (15.4)	7 (26.9)	5 (19.2)
Heavy	33 (67.3)	3 (6.1)	6 (12.2)	3 (6.1)	15 (57.7)	4 (15.4)	4 (15.4)	5 (19.2)

Table 2 (cont.).

	Statistical test		
	Interaction effect (Time*Gender) Wilks Lambda, <i>F</i> , <i>p</i>	Main effect for Time Wilks Lambda, <i>F</i> , <i>p</i>	Main effect for Gender <i>F</i> , <i>p</i>
[mean (sd)]			
CPD	0.970, (3,71) 0.741, 0.531	0.298, (3,71) 55.683, <0.0005	0.005, 0.942
Breath CO level	0.936, (3,68) 0.882, 0.455	0.586, (3,68) 16.037, <0.0005	1.349, 0.249
FTND scores	0.959, (3,71) 1.015, 0.391	0.436, (3,71) 30.646, <0.0005	0.011, 0.917
GN-SBQ scores	0.949, (3,69) 1.238, 0.303	0.434, (3,69) 30.047, <0.0005	0.000, 0.985
	Between gender Chi square, <i>p</i>	Within gender Chi square, <i>p</i>	
		Males	Females
Smoking <sup>a</sup> [n (%)]			
Abstinent	Base: 0.687, 0.407		
Mild	W12: 4.440, 0.218	Base-W12: 59.571, <0.0005	Base-W12: 27.635, <0.0005
Moderate	W24: 0.356, 0.949	W12-24: 2.771, 0.428	W12-24: 1.590, 0.662
Heavy	W36: 4.574, 0.206	W24-36: 2.251, 0.522	W24-36: 0.587, 0.899

Note. CO: carbon monoxide; CPD: cigarettes per day; FTND: Fagerström Test for Nicotine Dependence; GN-SBQ: Glover-Nilsson Smoking Behavioral Questionnaire; TNP: transdermal nicotine patches; sd: standard deviation; W: week.

<sup>a</sup> Smoking self-reported status: Abstinent: self-reported CPD 0, Mild: self-reported CPD 1-10, Moderate: self-reported CPD 11-20, Heavy: self-reported CPD >20.

<sup>b</sup> *F* is presented as: (Hypothesis df, Error df) *F* value.

## Safety and tolerability

During the 12-week active treatment no patients made suicide attempts or required hospitalization (Table 3). There was significant increase in abdominal perimeter in males [from 105.98 (SD 13.28) to 108.52 (SD 14.01),  $t=3.436$ ,  $p=0.002$ ], but not in females.

There were no significant gender differences in adverse events. The most common were constipation (14.3 males, 26.9% females), abnormal/vivid dreams (18.4 males, 15.4% females), nausea/vomiting (10.2 males, 26.9% females) and skin rash/redness around patch site (14.3 males, 15.4% females).

## Variables related to cessation

At week 12, success in tobacco smoking cessation in males was associated with: lower proportion of suicide history

( $p=0.020$ ) and lower psychopathology severity ( $p=0.020$ ) and psychological nicotine dependence ( $p=0.011$ ) at baseline. In females, it was associated with being married or living as married ( $p=0.047$ ).

## Discussion

The present study is the first to examine gender differences in the efficacy, safety and tolerability of the McSCSP specifically designed for the treatment of patients with SMD under real-world clinical conditions. It has demonstrated the effectiveness in males and females. There were not differences between groups in the cessation rates at any time point, neither controlled by diagnosis or treatment.

There were no significant gender differences on a range of smoking related variables at baseline. As in previous

Table 3. *Safety in males and females.*

	Males		
	Baseline Mean (sd)	Week-12 Mean (sd)	Paired <i>t</i> test, <i>p</i>
PANSS			
- PANSS-Positive	11.5 (3.8)	10.7 (3.9)	2.252, 0.030
- PANSS-Negative	15.1 (5.0)	14.5 (5.5)	1.812, 0.078
- PANSS-General Psychopathology	26.3 (5.9)	24.2 (6.0)	2.840, 0.007
- PANSS-Total	52.9 (11.1)	49.5 (11.4)	3.099, 0.004
HDRS	5.6 (4.3)	4.9 (5.7)	0.381, 0.712
YMRS	1.9 (2.7)	2.0 (4.6)	-0.086, 0.933
CGI-S	3.6 (1.0)	3.5 (1.0)	0.206, 0.837
Weight (kg)	89.2 (18.5)	90.7 (18.7)	-3.371, 0.002
BMI (kg/m <sup>2</sup> )	30.3 (5.8)	30.9 (5.8)	-4.126, <0.0005
Heart rate (bpm)	81.8 (15.6)	82.3 (17.8)	0.297, 0.768
Blood pressure			
- Diastolic (mmHg)	75.0 (12.6)	76.8 (11.0)	-1.255, 0.216
- Systolic (mmHg)	116.0 (17.9)	121.0 (19.5)	-1.638, 0.109
Creatinine (mg/dL)	0.9 (0.1)	0.9 (0.1)	1.807, 0.077
Urea (mg/dL)	29.2 (7.9)	29.8 (8.0)	-0.813, 0.420
Glomerular filtration rate mL/min per 1.73 m <sup>2</sup>	100.9 (18.7)	101.4 (18.9)	-0.329, 0.744
AST (U/L)	21.6 (9.1)	22.4 (8.7)	-1.155, 0.254
ALT(U/L)	28.5 (17.0)	32.6 (21.1)	-1.933, 0.059
GGT(U/L)	42.2 (30.6)	43.4 (30.0)	-0.678, 0.501
Total bilirubin (mg/dL)	0.5 (0.2)	0.4 (0.2)	1.033, 0.308
ALP (U/L)	71.3 (21.0)	70.3 (20.9)	0.990, 0.327
Cholesterol (mg/dL)	207.2 (43.9)	198.3 (44.5)	2.281, 0.027
HDL-cholesterol (mg/dL)	40.5 (10.7)	41.4 (11.1)	-1.300, 0.200
LDL-cholesterol (mg/dL)	134.3 (41.9)	120.8 (40.9)	2.823, 0.009
Triglycerides (mg/dL)	202.6 (142.5)	224.4 (158.8)	-1.357, 0.184

Table 3 (cont.).

	Females		
	Baseline Mean (sd)	Week-12 Mean (sd)	Paired <i>t</i> test, <i>p</i>
PANSS			
- PANSS-Positive	11.1 (4.0)	8.9 (2.2)	2.219, 0.044
- PANSS-Negative	14.4 (7.1)	15.0 (7.6)	-0.402, 0.694
- PANSS-General Psychopathology	29.5 (12.4)	24.3 (7.0)	1.549, 0.144
- PANSS-Total	50.3 (12.4)	48.2 (13.1)	0.477, 0.641
HDRS	5.0 (3.8)	4.8 (4.8)	0.210, 0.838
YMRS	4.1 (1.9)	2.7 (3.9)	1.288, 0.230
CGI-S	3.5 (1.0)	3.3 (1.0)	1.309, 0.203
Weight (kg)	79.4 (14.2)	81.9 (14.1)	-3.375, 0.003
BMI (kg/m <sup>2</sup> )	31.5 (5.7)	32.6 (5.8)	-3.594, 0.002
Heart rate (bpm)	85.6 (16.4)	81.3 (15.6)	1.456, 0.160
Blood pressure			
- Diastolic (mmHg)	75.8 (9.2)	77.2 (9.5)	-0.811, 0.426
- Systolic (mmHg)	115.4 (14.2)	116.4 (11.5)	-0.279, 0.783
Creatinine (mg/dL)	0.7 (0.1)*	0.7 (0.1)*	-2.119, 0.045
Urea (mg/dL)	34.6 (9.9)	33.7 (10.4)	0.571, 0.574
Glomerular filtration rate mL/min per 1.73 m <sup>2</sup>	98.2 (23.3)	92.4 (17.1)	2.191, 0.043
AST (U/L)	17.5 (5.6)	19.3 (8.4)	-1.187, 0.248
ALT(U/L)	19.8 (8.2)	22.3 (15.4)	-0.738, 0.468
GGT(U/L)	31.0 (18.6)	31.4 (18.9)	-0.387, 0.702
Total bilirubin (mg/dL)	0.4 (0.2)**	0.4 (0.2)**	-2.127, 0.045
ALP (U/L)	76.2 (19.9)	73.8 (18.7)	1.470, 0.155
Cholesterol (mg/dL)	206.4 (39.2)	209.7 (36.9)	-0.944, 0.355
HDL-cholesterol (mg/dL)	51.8 (10.8)	52.6 (10.5)	-0.796, 0.434
LDL-cholesterol (mg/dL)	132.4 (29.7)	129.4 (31.3)	0.522, 0.610
Triglycerides (mg/dL)	134.8 (109.8)	148.3 (104.0)	-1.522, 0.149

*Note.* ALP: alkaline phosphatase; ALT: alanine aminotransferase; AST: aspartate aminotransferase; BMI: body mass index; CGI-S: Clinical Global Impression - Severity; GGT: gamma glutamyl transferase; HDL: High-density lipoprotein; HDRS: Hamilton Depression Rating Scale; LDL: low-density lipoprotein; PANSS: Positive and Negative Syndrome Scale; sd: standard deviation; YMRS: Young Mania Rating Scale. \*Baseline 0.7096 (0.11767); Week-12 0.7308 (0.10480); \*\* 0.3565 (0.17629); 0.3700 (0.18918).

studies we found fewer gender differences in smokers with SMD compared to those in the general population (Filia et al., 2014). People with SMD (males and females) have higher rates of smoking (Kumari & Postma, 2005) and nicotine dependence than smokers in the general population, they smoke more cigarettes per day and have higher FTND scores (Gurpegui et al., 2005), so this may make smokers with severe disorders a more homogenous group (Filia et al., 2014).

As in scarce previous studies in patients with mental illness (Filia et al., 2014), there are no gender differences in the cessation rates which is different from the general population where females have more difficulty quitting and poorer smoking-cessation treatment outcomes (McKee, O'Malley, Salovey, Krishnan-Sarin & Mazure, 2005; Perkins & Scott, 2008; Reid et al., 2009; Smith, Bessette, Weinberger, Sheffer & McKee, 2016). However, in spite of this lack of significant differences, the cessation rate at 12-week looks higher in females. At 24-week and 36-week the cessation rate looks the same. These results are of interest since it looks like males who achieve short-term abstinence keep it while a high percentage of women return smoking after abstinence (15.4% vs 4.1%).

There were not psychopathological exacerbations, neither suicide attempts or hospitalizations. Moreover, males improved more than females, decreasing PANSS positive, general psychopathology and total scores, while females just improved in positive symptomatology. According previous studies (Ostacher et al., 2006), there is an association between smoking and greater severity of the mental disorder, so maybe the smoking cessation of those patients could contribute to this improvement. Other studies find that higher PANSS total scores are less frequent in mildly dependent smokers (Aguilar, Gurpegui, Diaz & De Leon, 2005).

Smoking cessation is frequently associated with weight gain (Aubin, Farley, Lycett, Lahmek & Aveyard, 2012). In agreement with this, we found that both, males and females, experienced significant increases in weight (around 4 kg) and BMI and, males, in abdominal perimeter as well. As in previous studies (Filia, Baker, Gurvich, Richmond & Kulkarni, 2014), there were no gender differences regarding weight increased.

In this study, the variables related to successful tobacco smoking cessation at week-12 in males were the lack suicide history and lower psychological nicotine dependence and psychopathology severity (CGI-S) at baseline. In females the variable related to successful tobacco smoking cessation was civil status, specifically be married or living as married. Among males and females with mental illness, baseline expired CO level and a greater number of visits to the program have been shown as predictive of smoking cessation while among males, having a history of alcohol, heroin and other opioids, and marijuana use were predic-

tive of unsuccessful smoking cessation (Okoli et al., 2011). The knowledge about the factors related with the successful tobacco smoking cessation may be important in the design of future smoking cessation programs for individuals with SMD.

Our results should be interpreted in light of a series of methodological limitations. First, the relatively small sample size in each group, which can be related with the absence of more gender differences. For this reason, we did not divide each gender group by diagnosis, in spite the significant differences. Secondly, this study was conducted with a sample of smokers with psychosis and bipolar disorders, so they are not a homogeneous group.

In conclusion, we have demonstrated that is effective and safe to help patients either males or females with stabilized SMD to quit tobacco. Future research with larger samples is required in order to more clearly determine if there are or not differences and the reliability and robustness of them.

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# Smoking cessation interventions in substance use disorders treatment centers of Catalonia: The abandoned addiction

## *Intervenciones para dejar de fumar en los centros de atención a las drogodependencias de Cataluña: La adicción abandonada*

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### Abstract

Substance use disorders (SUD) treatment centers are an optimal setting for delivering smoking cessation interventions (SCI). This study aimed to examine the adoption of SCI in SUD treatment centers in Catalonia (Spain) as well as to assess their managers' views on the appropriateness and feasibility of providing SCI. Managers directly in charge of SUD treatment centers (n = 57) answered a 30-item on-line questionnaire. Data was obtained of 50 centers (87.7% response rate). Forty-six per cent of the centers provided some kind of SCI, but only 4.8% of the new patients were treated for smoking cessation. Managers reported that 73.3% of mental health professionals working in SUD centers had not been trained in SCI. Sixty-four per cent of managers agreed that all health professionals should deliver SCI. Those centers offering SCI attended more patients and were more likely to have professionals trained in SCI than those not offering SCI. The implementation of SCI in SUD treatment centers in Catalonia was suboptimal. Continuing education and training should be provided

### Resumen

Los centros de tratamiento de drogodependencias son un recurso óptimo para realizar intervenciones para la cesación tabáquica (ICT). El objetivo de este estudio fue examinar la implementación de ICT en la red de centros de atención a las drogodependencias (CAS) de Cataluña, así como evaluar las opiniones sobre la adecuación y viabilidad de la provisión de ICT. Los responsables de los CAS (n = 57) contestaron un cuestionario on-line compuesto por 30 ítems. Se obtuvieron datos de 50 centros (87,7% tasa de respuesta). El 46% de los CAS ofrecía algún tipo de ICT, pero sólo un 4,8% de los nuevos pacientes eran tratados para dejar de fumar. Además, los responsables informaron que el 73,3% de los profesionales que trabajaban en los CAS no había recibido formación en ICT. El 64% de los responsables estaba de acuerdo que todos los profesionales deberían realizar ICT. Aquellos centros que ofrecían ICT visitaban más pacientes y era más probable que tuviesen profesionales formados en ICT, comparado con los centros que no ofrecían ICT. La implementación de ICT en los CAS de Cataluña era subóptima. Se debería

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for all health professionals working in SUD centers. Not systematically delivering SCI to patients in treatment for other SUD means missing opportunities to reduce health and economic costs while perpetuating a smoking culture.

**Keywords:** Smoking cessation; substance-related disorders; substance abuse treatment centers; attitude of health personnel; education.

**S**moking rates in people with Substance Use Disorders (SUD) are two to four times those of the general population reaching between 75% and 85% (Guydish et al., 2016). In addition, people with SUD smoke more cigarettes per day and develop higher levels of nicotine addiction than the general population, even compared with people with other psychiatric disorders (Grant, Hasin, Chou, Stinson & Dawson, 2004). Therefore, smoking-related morbidity and mortality is highly prominent in this population, as between 36% and 49% of all deaths are because of smoking-related conditions (Callaghan, Gatley, Sykes & Taylor, 2018). However, people with SUD are interested in quitting smoking when they are asked (Joseph, Nelson, Nugent & Willenbring, 2003; Nahvi, Richter, Li, Modali & Arnsten, 2006), and they can achieve long-term tobacco abstinence (Smith, Mazure & McKee, 2014). In fact, evidence-based interventions targeted at smokers in treatment or recovery for SUD increase tobacco abstinence (Apollonio, Philipps & Bero, 2016), and quitting smoking has a positive effect on substance use outcomes (McKelvey, Thrul & Ramo, 2017; Tsoh, Chi, Mertens & Weisner, 2011; Weinberger, Platt, Jiang & Goodwin, 2015).

Moreover, clinical practice guidelines encourage all clinicians, including those working in SUD treatment programs, to adopt evidence-based practices to treat tobacco dependence (Camarelles et al., 2013; Fiore et al., 2008; National Institute for Health and Care Excellence, 2013; R  ther et al., 2014). Indeed, outpatient SUD treatment centers are an optimal setting for delivering smoking cessation interventions (SCI), as integrating tobacco dependence treatment provides a consistent message targeting all substance dependencies. Moreover, these interventions are related to positive lifestyle changes, to the reduction of attendance problems and to achieving better abstinence rates compared with patients referred to an external cessation clinic (McFall et al., 2010).

However, smoking among people with SUD is too often overlooked, as four out of 10 mental health professionals (MHPs) perceive barriers to deliver smoking cessation interventions, have negative attitudes towards smoking cessation, and permissive attitudes toward smoking (Sheals,

facilitar formaci  n continuada a los profesionales de los CAS. No intervenir sobre el consumo de tabaco en pacientes en tratamiento por otras drogodependencias significa perder oportunidades para reducir costes en salud y econ  micos mientras perpetuamos una cultura fumadora.

**Palabras clave:** Dejar de fumar; trastornos por consumo de sustancias; centros de tratamiento de drogodependencias; actitud del personal sanitario; formaci  n.

Tombor, McNeill & Shahab, 2016). Smokers are also over-represented in MPHs working in SUD treatment services, which helps to normalize tobacco use. Additionally, those who smoke are less likely to deliver SCI (Pipe, Sorensen & Reid, 2009). Many of these issues contribute to perpetuate a culture of smoking among SUD treatment services (Bowman & Walsh, 2003).

A review on the implementation of SCI in SUD treatment centers in US found that although 86% of MHPs asked their patients about smoking, only 40% of patients were advised to quit or assessed for willingness to quit (Knudsen, 2017). However, little attention has been paid to these issues in Europe, with scarce studies conducted to assess the provision of SCI in SUD treatment centers. This study aims to examine the adoption of SCI in the SUD treatment centers in Catalonia (Spain), and briefly describe the SCI offered. We also assess their managers' views on the appropriateness and feasibility of the integration of SCI in the context of treatment for other addictions. Finally, we search for variables associated with delivering SCI.

## Methods

### *Design, sample*

Data for this cross-sectional study were collected between 2015 and 2016 through an on-line questionnaire. The survey target population was clinical managers directly in charge of SUD treatment centers. All these centers managed only outpatients.

There are 57 public SUD treatment centers in Catalonia (excluding those in penitentiary centers;  $n = 2$ ). Catalonia is a territory of more than 7.5 million inhabitants in the north-east of Spain and SUD treatment centers attend to over 16,000 patients per year.

### *Measures*

We designed an ad-hoc 30-item questionnaire to assess SCI and attitudes relating to smoking cessation within the context of other addictions. The questionnaire was developed in consensus among the professionals of the Tobacco Working Group of the Substance Abuse Treatment Network of Catalonia. The questionnaire (available at: [shorturl.at/sgwv](http://shorturl.at/sgwv))

turl.at/bnvpv6) had four parts assessing different areas: 1) organizational characteristics, 2) characteristics of the SCI, 3) staff training in SCI and interest in receiving new training, and 4) managers' attitudes toward the appropriateness and feasibility of SCI provision in their centers. In part 1, 2 and 3, all questions were dichotomous (yes/no), asked for specific numbers (E.g., the number of professionals trained), or respondents could select multiple answers from a defined list of choices (E.g., the type of SCI provided). In part 4, attitudes were assessed on a 3-point Likert scale ranging from 1 = agree to 3 = disagree.

Additionally, authors classified SUD treatment centers by type (with or without supervised injecting facilities), location in a health care setting (i.e. hospital department, community mental health center, or freestanding), and municipality population (>50,000 inhabitants was considered big and <50,000 small).

### Procedure

A complete list of public SUD treatment centers was obtained from the Health Department of the Catalan Government ( $n = 57$ ). Managers were emailed with a letter of invitation explaining the overall goal of the survey which included a link to the survey. Non-respondents were re-invited by e-mail up to three times. A telephone call asking for participation was made after three reminders.

### Data analyses

Descriptive statistics were computed in order to have a snapshot of the organizational characteristics of participating centers. Organizational characteristics, training, and attitudes were treated as independent variables and the provision of SCI as a dependent variable. To compare centers with a SCI and those without, Chi squared tests were used to determine relationships between categorical variables, and Student's  $t$ -tests for quantitative variables. Odds ratios (OR) with 95% confidence intervals (CI) were reported for binary variables. Cohen's  $d$  was calculated for significant differences for quantitative variables. Manager's views were compared with the Fisher exact test. All tests were two-tailed and conducted with an alpha of 0.05. SPSS version 20.0 for Windows was used for all statistical analysis.

## Results

Data of 50 centers were obtained (87.7% response rate). Non-respondents did not give specific reasons for not answering. Among respondents, SUD treatment centers were very different in size: the average number of professionals (including non-clinical staff) was 9.6 (range 2-34,  $n = 479$ ). Clinicians represented 89.8% of all staff. Overall, the most common occupation was psychiatrist (26.9%), followed by psychologist (20.9%), nurse (17.7%), social

worker (11.3%), and others (22.9%). All centers had at least a part-time psychiatrist and a part-time psychologist. One center had no nurse and two had no social worker. A total of 16,859 new patients were seen in all centers in the previous year (2014). The average of new patients for any SUD during 2014 was 344 (Standard deviation 337.5; range 0-1652).

Forty-six per cent ( $n = 23$ ) of the SUD centers provided some kind of SCI (see table 1 for a description). Sixty-five per cent of them accepted patients for smoking cessation without other SUD. A total of 809 new patients were treated for smoking cessation, which represented 4.8% of all new patients in 2014.

Regarding training, 73.3% ( $n = 315$ ) of all professionals had not received any training on SCI. On the other hand, 66% ( $n = 33$ ) of the SUD treatment centers declared they were interested in receiving training.

In reference to manager's attitudes, 78% of managers agreed that "SCI in the SUD treatment centers complements primary care provision", and only 6% disagreed; 74% agreed with "people who want to quit smoking have the right to be treated in the SUD treatment centers", and only 2% disagreed; 74% agreed that "professionals who deliver SCI at SUD treatment centers need greater recognition and the authorities' support", whereas 8% disagreed; 67% agreed that "a common protocol needs to be created", whereas 12.5% disagreed; 60% agreed that "all professionals should be trained in SCI", whereas 12% disagreed; and finally 64% agreed with "all professionals should deliver SCI", whereas 10% disagreed (the rest neither agreed nor disagreed for each statement).

Centers delivering SCI attended to more patients than those not delivering SCI ( $t = 2.5$ ;  $df = 33$ ;  $p = 0.018$ ), but no other differences were found. Regarding training, the former had more professionals trained in SCI ( $t = 2.2$ ;  $df = 47$ ;  $p = 0.034$ ), although interest in training was not associated with delivering SCI. No significant differences were found in managers' views (table 2).

## Discussion

According to our study, almost half of the centers that provided SUD treatment in Catalonia offered SCI. Centers that provided SCI attended more patients than those not delivering SCI. Most of them accepted patients without a SUD other than tobacco use disorder. SCI represented less than 5% interventions in new patients. Most centers reported prescribing smoking cessation medication, delivering motivational interview and individual counseling, however running smoking cessation groups was uncommon. On the other hand, only one out of four professionals had received training, and those centers with trained professionals were more likely to deliver SCI. Most managers agreed that all professionals should deliver SCI.

Table 1. *Main characteristics of the Smoking Cessation Interventions delivered in the Substance Use Disorders Treatment Centers % (n).*

<b>Number of professionals who deliver SCI</b>	
Physicians	32.5 (42)
Psychologists	23.9 (24)
Nurses	11.7 (10)
Social workers	3.7 (2)
Others	1.1 (1)
<b>Year of starting delivering SCI, before 2000</b>	52.2 (12)
<b>Total time dedicated to deliver SCI, less than 10% of time</b>	78.3 (18)
<b>Type of intervention</b>	
Motivational interview	65.2 (15)
Individual counseling	65.2 (15)
Group counseling	30.4 (7)
Use of smoking cessation medication	87 (20)
<b>Time of follow-up, 12 months</b>	39.1 (9)
<b>Number of visits during the first three months, 3-5 visits</b>	52.2 (12)
<b>Targeted smokers</b>	
General population	60.9 (14)
Population with smoking-related illness	60.9 (14)
Population with psychiatric disorders	65.2 (15)
<b>Referrals</b>	
Self-referrals	57.1 (12)
Primary care	66.7 (14)
Specialist physicians	57.1 (12)
Mental health centers	85.7 (18)
Occupational health	9.5 (2)
<b>Waiting list</b>	
Less than 1 month	73.9 (17)
Separated waiting list	34.8 (8)

There are only two previous studies on the subject conducted in Spain. Becona et al., (2006) found that 55.6% of SUD treatment centers (with a 53% response rate) from 11 out of 17 autonomous regions of Spain (including Catalonia), offered SCI in 2004. This result is quite similar to that found in our study (55.6% *vs.* 46% in our study), although our results were obtained 10 years later. Moreover, important changes have occurred in these years in the field, as a total smoking ban in all health services (including psychiatric inpatient and outpatient SUD treatment services) came into force in 2011. Recently, improvements in tobacco control have occurred in Catalonia, such as increasing health professionals' awareness of the risks of smoking, training in smoking cessation, and achieving good compliance with the national smoking ban (Ballbè, Gual, Nieva, Saltó & Fernández, 2016). However, these improvements seem not to have changed SUD centers' practices. The other study conducted in Asturias (another autonomous region), found that only 20% of SUD centers delivered SCI (González-Roz et al., 2019). Disparities may reflect an inconsistent implementation of SCI across Spain.

According to our study, affiliation to hospitals was not associated with SCI delivery unlike some studies conducted in the US (Eby & Laschober, 2013; Eby, Laschober &

Muilenburg, 2015). Organizational differences may explain these results. Other variables associated with SCI such as non-profit organization, reimbursement or financial resources (Eby et al., 2015) could not been analyzed because all the centers surveyed were public and at the time of the study public healthcare in Catalonia did not cover smoking cessation medication.

Regarding training, our results are consistent with other studies concluding that trained professionals are more likely to deliver SCI (Carson et al., 2012), and that training is scarce and an unmet need in SUD centers (Knudsen, 2017).

Attitudes of managers' were not different according to the provision or not of SCI. Other studies found a more supportive attitude toward SCI by staff working in centers providing SCI, also centers serving pregnant women, but less supportive when centers had residential treatment (Fuller et al., 2007). However, in our study centers were more homogenous, as all centers accepted all populations and none delivered residential treatment. Therefore the role of those variables could not be analyzed.

This study addresses a topic scarcely researched in Europe, and also is the first to describe SCI in SUD centers in Catalonia. A high response rate (87.7%) is a strength. This study also elucidates managers' views regarding delivering

Table 2. *Organizational characteristics, staff's training and manager's views in Substance Use Treatment Centers by delivering or not smoking cessation interventions (n = 50).*

	SUD centers delivering SCI (n = 23) % or mean (SD)	SUD centers NOT delivering SCI (n = 27) % or mean (SD)	Cohen's d <sup>1</sup>	OR (95% CI) <sup>2</sup>
<b>Number of professionals</b>				
Physicians	2.96 (2.36)	2.26 (1.38)		
Psychologists	2.3 (1.29)	1.76 (0.75)		
Nurses	1.76 (0.94)	1.67 (1.04)		
Social workers	1.08 (0.56)	1.09 (0.39)		
Others	2.15 (3.76)	2.22 (3.4)		
All	10.3 (6.7)	9 (5.84)		
<b>New patients in 2014</b>	468.48 (402.61)	234 (221.87)	0.72	
<b>Big municipality</b> (>50,000 inhabitants)	69.6%	51.9%		2.1 (0.66-6.8)
<b>Centers with supervised injecting facilities</b>	8.7%	25.9%		0.27 (0.05-1.47)
<b>Located in a health setting</b>	43.5%	25.9%		2.2 (0.67-7.2)
<b>Number of professionals trained in smoking cessation</b>	36 (21.01)	22.39 (22.39)	0.63	
<b>Interested in receiving training in smoking cessation</b>	56.5%	74.1%		0.45 (0.14-1.5)
<b>Managers' attitudes</b>				
(1) SCI delivered in SUD treatment centers complements primary care service, agree <sup>3</sup> .	78.3%	77.8%		
(2) People who want to quit smoking have the right to be treated in the SUD centers, agree.	69.6%	77.8%		
(3) Professionals who deliver SCI need greater public recognition and health authorities support, agree.	73.9%	74.1%		
(4) A common protocol on SCI needs to be created, agree.	52.2%	80%		
(5) All health professionals should be trained in smoking cessation, agree.	52.2%	66.7%		
(6) All health professionals at the SUD treatment centers should deliver SCI, agree.	60.9%	66.7%		

Note. <sup>1</sup> Cohen's d was calculated for continuous variables. <sup>2</sup> OR = odds ratio; CI = confidence interval; calculated for dichotomous variables.

<sup>3</sup> Percentage of those who agree.

SCI from SUD centers for, according to the authors' knowledge, the first time in Spain. This study has also limitations. As a cross-sectional study, no information on change in the adoption of SCI over time is provided. Also, information is provided by managers, and the accuracy of the self-reported responses could not be verified. Finally, besides the high response rate, the sample size was low and may have affected results.

Future research should focus on the barriers of implementation of SCI in SUD centers. As training seems a key subject, continuing education and training should be provided and incentivized for professionals working in SUD centers. Additionally, a qualitative study of staff attitudes would improve the understanding of this matter. Also, as some evidence-based medications to quit smoking are financed since the beginning of 2020 by the Spanish public health ministry, new studies are warranted.

This study presents a large unmet clinical need. Conclusions should be a wake-up call for health authorities. Not systematically delivering SCI in patients in treatment for other SUD means losing opportunities to reduce tobacco and other drugs' costs while perpetuating a smoking culture.

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## Conflict of interests

All authors declare they have no conflicts of interest.

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# Psychopathy, addictions and female gender: Comparative study using the Psychopathy Checklist Revised and the Comprehensive Assessment of Psychopathic Personality

## *Psicopatía y adicciones en mujeres: Estudio comparativo utilizando el Psychopathy Checklist Revised y el Comprehensive Assessment of Psychopathic Personality*

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### Abstract

Traditionally, psychopathy research has focused on assessing men with the Psychopathy Checklist Revised (PCL-R). Research on women with other assessment tools is scarce. The objective of this study is to evaluate psychopathy, using various tools, in a sample with both women and men. The study involved 204 inmates (mean age (DS) = 40.93 (11.8)), 28 women (13.7%), in the Pereiro de Aguiar penitentiary (Ourense). Sociodemographic, substance use, and criminal variables were collected, and all were evaluated with the following tools: PCL-R, Comprehensive Assessment of Psychopathic Personality (CAPP), and the International Personality Disorder Examination. In this sample, when assessed with the PCL-R, males obtained significantly higher scores on facet 4, which measures antisocial behaviour. Women obtained significantly higher scores on the Self domain in the CAPP, measuring narcissism. No symptom or item was able to clearly discriminate psychopathic women from psychopathic men in a Support Vector Machine model. The construct of psychopathy is similar for women and men in this representative penitentiary sample. Women showed higher scores for narcissism and men for antisociality. It is better to combine the PCL-R with another tool such as the CAPP to assess these psychopathological differences. No symptom or item has a score that can be recommended as a method for discriminating psychopathic women from psychopathic men.

**Keywords:** Psychopathy; women; addictions; Psychopathy Checklist Revised; Comprehensive Assessment of Psychopathic Personality.

### Resumen

La investigación en psicopatía se ha centrado tradicionalmente en la evaluación de varones con el Psychopathy Checklist Revised (PCL-R). La investigación en mujeres utilizando otros instrumentos de evaluación es muy escasa. El objetivo de este estudio es evaluar la psicopatía, utilizando varios instrumentos, es una muestra que incluya mujeres y varones. 204 internos (edad media (SD) = 40,93 (11,8)), 28 mujeres (13,7%), del Centro Penitenciario de Pereiro de Aguiar (Ourense) participaron en este estudio. Se recogieron variables sociodemográficas, consumo de sustancias, antecedentes delictivos y fueron evaluados con los siguientes instrumentos: PCL-R, Comprehensive Assessment of Psychopathic Personality (CAPP) y el International Personality Disorder Examination. En esta muestra representativa de la población penitenciaria se observó que en el PCL-R los varones obtenían puntuaciones significativamente más elevadas en la faceta 4 que mide la conducta antisocial. Las mujeres obtuvieron puntuaciones significativamente más elevadas en el CAPP en el dominio Self, que mide la conducta narcisista. No se obtuvo ningún síntoma o ítem que permitiese discriminar claramente a las mujeres psicopáticas de los varones psicopáticos utilizando un modelo de Máquinas de Vectores Soporte. El constructo de la psicopatía es similar para las mujeres y los hombres en esta muestra. Las mujeres presentan puntuaciones más elevadas de narcisismo y los varones de antisocialidad. Para valorar mejor estas diferencias psicopatológicas es mejor combinar el PCL-R con otro instrumento como el CAPP. Ningún síntoma o ítem tiene una puntuación que pueda recomendarse como método que permita discriminar a las mujeres psicopáticas de los varones psicopáticos.

**Palabras clave:** Psicopatía; mujer; adicciones; Psychopathy Checklist Revised; Comprehensive Assessment of Psychopathic Personality.

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**P**sychoopathy, or psychopathic personality disorder, is characterized by the following traits: shallow emotional response and lack of empathy, arrogant and grandiose interpersonal style, and erratic and impulsive behaviour (Blackburn, 2007; Cooke & Logan, 2015). However, there is no symptom/signal, or combination thereof, which is pathognomonic (Cooke & Logan, 2015). Despite the diagnostic difficulties inherent in the diagnosis of psychopathy through semi-structured interviews measuring the presence of certain symptoms or behaviours, numerous studies link psychopathy to a greater presence of antisocial behaviours, committing crimes, especially violent ones, and a greater tendency to recur in such behaviours and crimes (Blair & Lee, 2013; Cale, Lussier, McCuish & Corrado, 2015). This is why its assessment is essential in clinical and forensic settings when establishing follow-ups and treatment plans for patients or inmates involved in antisocial behaviour, in particular after committing violent crimes.

Although most studies on psychopathy have been on men admitted to prisons, there is no a priori reason to think that women cannot also be affected by this disorder. In fact, it is estimated that up to 17.4% of women who commit violent acts have a psychopathic disorder, compared to 31% of men (Carabellese et al., 2019; Gray & Snowden, 2016). It thus appears that this disorder, alongside other externalizing pathologies, is less frequent in women (Rial et al., 2019). On the other hand, numerous authors have shown that differences exist in the way that psychopathy manifests itself in women compared to men (Carabellese et al., 2019; Dolan & Vollm, 2009; Gray & Snowden, 2016; Guay, Knight, Ruscio & Hare, 2018; Thomson, 2017; Verona, Bresin & Patrick, 2013; Wynn, Hoiseth & Pettersen, 2012). Given that the main diagnostic tool for this disorder, the *Psychopathy Checklist Revised* (PCL-R), uses a quantitative cut-off point to determine the presence or absence of this disorder, it is not difficult to establish that men and women reach this cut-off point through qualitatively different symptom patterns; thus, the psychopathy research carried out in men should not be completely extrapolated to women. It needs to be proven through rigorous research. To date, studies indicate that women obtain lower scores on the PCL-R, especially on items related to behaviour disorders, substance use and addictions, and antisocial behaviour. In addition, the predictive power of a psychopathy diagnosis in terms of committing new crimes, especially violent ones, seems to be lower in women compared to men (Carabellese et al., 2019; Dolan & Vollm, 2009; Gray & Snowden, 2016; Guay et al., 2018; Nicholls, Ogloff, Brink & Spidel, 2005; Thomson, 2017; Verona et al., 2013; Wynn et al., 2012).

Furthermore, the PCL-R has been criticized for placing excessive emphasis on criminal behaviour (Blackburn, 2007; Cooke, Michie, Hart & Clark, 2004). This is of great

importance when assessing the presence of psychopathy in women since their crime pattern is different, with less substance use and thus a lower rate of addiction and addiction-related problems. In this pattern, as previously indicated, juvenile delinquency, revocation of probation, antisocial behaviours and violent crimes occur less frequently in women (Carabellese et al., 2019; Dolan & Vollm, 2009; Gray & Snowden, 2016; Guay et al., 2018; Nicholls et al., 2005; Thomson, 2017; Verona et al., 2013; Wynn et al., 2012). Given that all these behaviours influence the PCL-R scores, it is not difficult to understand the problem. Do women have a lower prevalence in terms of psychopathy, with a different symptomatic pattern to men? Or, conversely, is it simply a problem with the assessment instrument and its cut-off points, points that have been questioned given the cultural differences revealed (Cooke & Michie, 1999; Cooke, Michie, Hart & Clark, 2005).

One way to solve this problem is to combine the PCL-R with another assessment instrument that excludes criminal behaviour. The *Comprehensive Assessment of Psychopathic Personality* (CAPP) is the perfect tool for this assessment as it was designed to be able to assess psychopathy without assessing criminality. To date it has proven to be a valid and robust instrument in different international studies (Cooke, Hart, Logan & Michie, 2012; Florez et al., 2015; Sellbom, Cooke & Hart, 2015).

Therefore, to investigate the presence and characteristics of psychopathy in women compared to men, it would be very useful to compare the results of the PCL-R and the CAPP in a representative sample of prison inmates, with similar substance use by both sexes. This, then, is exactly what the present study sets out to test.

## Material and methods

The present study was conducted at the Pereiro de Aguiar penitentiary in Ourense. All convicted inmates were offered the opportunity to participate between April 2014 and April 2016. Inclusion criteria were having served at least 6 months of the sentence in the jail and signing informed consent. Exclusion criteria were not being fluent in Spanish and having an organic (involving significant manual, visual or language difficulties) or psychiatric disease (psychotic disorders, affective disorders, anxiety disorders and dementia) that prevented the inmate from participating in the study.

Participation data were as follows: of the 330 inmates evaluated, 204 met the inclusion criteria and took part in the study. The remaining 126 did not meet the criteria for these reasons: 10 did not want to participate, 16 did not speak fluent Spanish, 32 had an organic or psychiatric illness that prevented them from participating, and 68 (53.99%) inmates had not yet served at least 6 months of their sentence in the jail. Of the 126, 11 (8.73%) were

women and the rest, 115 (91.27%), were men. The final sample is representative of the penitentiary population.

The ratio among the participants of 176 men to 28 women is quite normal given the proportion in Spanish penitentiaries of 12 men to every woman (Vicens et al., 2011).

The research was approved by the Ethics Committee of Vigo - Ourense - Pontevedra (2014/009). The study was performed according to the Declaration of Helsinki (World Medical, 2013).

All participants were assessed using the following protocol:

- *International Personality Disorder Examination* (IPDE) DSM IV version (Lenzenweger, Lane, Loranger & Kessler, 2007): Semi-structured interview aimed at diagnosing categorical personality disorders (PD) following the DSM IV model.
- *Psychopathy Checklist Revised* (PCL-R) (Hare, Clark, Grann & Thornton, 2000): This is the gold-standard instrument in the field of psychopathy assessment. Semi-structured interview, supported by the information available in the history and that provided by informants who know the subject, to measure psychopathy across the lifespan through 20 symptoms. Each symptom is scored from 0 to 2. Its use is adapted to the forensic and prison environment. Symptoms are usually grouped into a 2-factor, 4-facet structural model: factor 1, interpersonal and affective [interpersonal (facet 1), affective (facet 2)] and factor 2, social deviation [lifestyle (facet 3), antisocial behaviour (facet 4)].
- *Comprehensive Assessment of Psychopathic Personality* (CAPP) (Kreis, Cooke, Michie, Hoff & Logan, 2012): Semi-structured interview which, unlike the PCL-R, does not score crime. It assesses 33 symptoms, scored from 1 to 7, and structured in 6 dimensions: attachment, behavioural, cognitive, dominance, emotional, and self. Symptoms are assessed over a 6- to 12-month period. In addition to the interview, all available information is collected using the history and informants who have known the inmate for at least 6 months.
- "Ad hoc" protocol of sociodemographic variables and those relating to substance use and prison: gender, age, nationality, years of education completed, marital status, total jail time in months, type and number of crimes committed, type, age of onset and lifetime consumption and number of addictive substances other than nicotine, including those prescribed as treatment (methadone, buprenorphine, benzodiazepines), separating alcohol use from alcohol abuse.

G. Flórez assessed all the participants using IPDE, PCL-R and CAPP in a blinded fashion with regard to the results of the sociodemographic and prison variables.

## Data analysis

All statistical analysis was performed using R software, version 3.4.3. A correlation matrix was computed with the total PCL-R scores, its factors and facets, and with the total scores and the CAPP domains. It covered the entire sample and was calculated separately for women and men.

Study variables are described by means and standard deviations for continuous variables, and by number of occurrences and percentages for categorical variables. With continuous variables, the Mann-Whitney test was used when comparing two non-normally distributed groups. For categorical variables, comparisons were made using the Chi-square test, or Fisher's exact test in those cases where the theoretical frequencies were lower than 5. The Pearson correlation coefficient was used as a method for measuring the strength of linear association between continuous variables and multiple linear and logistic regression models in order to detect possible multivariate relationships. The logistic regression models used gender as the dependent variable. The goodness of fit of the models obtained was verified using the Hosmer and Lemeshow test. The presence of multicollinearity problems between predictors was ruled out before inclusion in the logistic regression models.

Finally, a support vector machines model was applied with the aim of creating, in a computationally efficient way, hyperplanes capable of performing separations in spaces characterised by a large number of dimensions. We applied this model with the aim of determining whether it is possible to differentiate between men and women based on results obtained with the CAPP and PCL-R instruments. In those cases where the data are not linearly separable, a problem posed by this sample, they can be cast into a higher-dimensional space where it is possible to make a linear separation. Another possible strategy is to accept that there will be data that cannot be correctly classified and to try to correctly classify the greatest amount of information by minimizing its loss function. A combination of both techniques was used in this study.

A value of  $p < 0.05$  was considered significant.

## Results

Table 1 shows the distribution of variables and the prevalence of PD according to the IPDE by gender.

It can be seen in Table 1 that both groups were similar, since statistically significant differences were only found in the following variables: the men had spent more time in jails, had consumed and abused more alcohol, so they had a higher percentage of convictions for driving under the influence of alcohol, and had also used more cannabis; men had received more diagnoses of antisocial personality disorder (APD), while women had been diagnosed with the following PDs more often: borderline, narcissistic, histrionic, and dependent.

Table 1. Sociodemographic and prison variables of the sample, together with prevalence of Personality Disorders according to IPDE, by gender.

Variables	Women (28)		Men (176)		p	
Age [mean (SD)]	40.89 (11.16)		40.97 (11.20)		t=0.03	p=0.97
Nationality						
Spanish	22	78.57%	157	89.20%	X <sup>2</sup> =1.64	
Other	6	21.43%	19	10.80%	p=0.199	
Education: years completed [median, (SD)]						
Lower	8.75	(2.15)	8.84	(1.95)	t=0.20	p=0.84
Higher	0.21	(0.69)	0.24	(0.88)	t=0.17	p=0.86
Marital status						
Married	5	17.86%	28	15.91%	X <sup>2</sup> =0.067	p=0.79
Remarried	2	7.14%	14	7.95%		p=1
Widow(er)	1	3.57%	0	0.00%		p=0.1373
Separated	6	21.43%	17	9.66%	X <sup>2</sup> =3.83	p=0.05
Divorced	5	17.86%	33	18.75%	X <sup>2</sup> =0.01	p=0.91
Single	9	32.14%	84	47.73%	X <sup>2</sup> =2.36	p=0.12
Total months in jail [mean (SD)]	45.61	(43.27)	79.77	(87.46)	t=3.25	p<0.01

Note. SD: Standard deviation; IPDE: International Personality Disorder Examination.

Table 2. Correlation matrix for PCL-R (total, factors and facets) and CAPP (total and domains) for the total sample, women (bold) and men (italics).

	PCLR total	PCLR F1	PCLR F2	PCLR f1	PCLR f2	PCLR f3	PCLR f4	CAPP A	CAPP B	CAPP C	CAPP D	CAPP E	CAPP S	CAPP total
<b>PCLR total</b>	<b>1.00</b>													
<b>PCLR F1</b>	0.83 <b>0.69</b> 0.85	<b>1.00</b>												
<b>PCLR F2</b>	0.86 <b>0.78</b> 0.88	0.46 <b>0.11</b> 0.53	<b>1.00</b>											
<b>PCLR f1</b>	0.76 <b>0.70</b> 0.77	0.90 <b>0.94</b> 0.89	0.43 <b>0.17</b> 0.49	<b>1.00</b>										
<b>PCLR f2</b>	0.73 <b>0.58</b> 0.74	0.89 <b>0.93</b> 0.89	0.39 <b>0.02</b> 0.55	0.59 <b>0.75</b> 0.58	<b>1.00</b>									
<b>PCLR f3</b>	0.83 <b>0.84</b> 0.83	0.47 <b>0.26</b> 0.51	0.93 <b>0.95</b> 0.93	0.47 <b>0.32</b> 0.50	0.37 <b>0.16</b> 0.40	<b>1.00</b>								
<b>PCLR f4</b>	0.72 <b>0.50</b> 0.76	0.36 <b>0.17</b> 0.44	0.88 <b>0.86</b> 0.89	0.29 <b>0.12</b> 0.37	0.35 <b>0.20</b> 0.42	0.64 <b>0.66</b> 0.65	<b>1.00</b>							
<b>CAPP A</b>	0.60 <b>0.57</b> 0.60	0.64 <b>0.65</b> 0.64	0.41 <b>0.27</b> 0.44	0.45 <b>0.48</b> 0.44	0.70 <b>0.75</b> 0.69	0.33 <b>0.26</b> 0.34	0.43 <b>0.22</b> 0.47	<b>1.00</b>						
<b>CAPP B</b>	0.62 <b>0.51</b> 0.63	0.41 <b>0.05</b> 0.45	0.65 <b>0.68</b> 0.66	0.37 <b>0.04</b> 0.41	0.36 <b>0.05</b> 0.40	0.60 <b>0.63</b> 0.60	0.57 <b>0.60</b> 0.59	0.55 <b>0.32</b> 0.57	<b>1.00</b>					
<b>CAPP C</b>	0.58 <b>0.39</b> 0.61	0.49 <b>0.22</b> 0.51	0.52 <b>0.41</b> 0.55	0.37 <b>0.21</b> 0.39	0.50 <b>0.21</b> 0.53	0.46 <b>0.41</b> 0.48	0.48 <b>0.32</b> 0.52	0.70 <b>0.29</b> 0.74	0.75 <b>0.70</b> 0.75	<b>1.00</b>				
<b>CAPP D</b>	0.68 <b>0.33</b> 0.72	0.72 <b>0.64</b> 0.74	0.46 <b>0.03</b> 0.54	0.62 <b>0.57</b> 0.62	0.67 <b>0.63</b> 0.68	0.41 <b>0.004</b> 0.47	0.42 <b>0.14</b> 0.51	0.80 <b>0.56</b> 0.82	0.63 <b>0.30</b> 0.65	0.78 <b>0.33</b> 0.81	<b>1.00</b>			
<b>CAPP E</b>	0.64 <b>0.26</b> 0.68	0.61 <b>0.43</b> 0.63	0.50 <b>0.05</b> 0.57	0.43 <b>0.32</b> 0.44	0.65 <b>0.49</b> 0.67	0.43 <b>0.11</b> 0.49	0.48 <b>0.07</b> 0.55	0.79 <b>0.52</b> 0.82	0.61 <b>0.36</b> 0.63	0.78 <b>0.25</b> 0.80	0.91 <b>0.75</b> 0.92	<b>1.00</b>		
<b>CAPP S</b>	0.62 <b>0.48</b> 0.65	0.67 <b>0.70</b> 0.67	0.41 <b>0.13</b> 0.48	0.64 <b>0.66</b> 0.64	0.55 <b>0.66</b> 0.55	0.37 <b>0.20</b> 0.41	0.37 <b>0.01</b> 0.47	0.68 <b>0.60</b> 0.70	0.59 <b>0.21</b> 0.63	0.67 <b>0.23</b> 0.70	0.84 <b>0.72</b> 0.85	0.73 <b>0.43</b> 0.75	<b>1.00</b>	
<b>CAPP total</b>	0.71 <b>0.59</b> 0.74	0.69 <b>0.64</b> 0.70	0.55 <b>0.33</b> 0.61	0.57 <b>0.55</b> 0.58	0.65 <b>0.65</b> 0.66	0.49 <b>0.37</b> 0.53	0.51 <b>0.20</b> 0.58	0.84 <b>0.74</b> 0.86	0.78 <b>0.64</b> 0.80	0.87 <b>0.61</b> 0.89	0.96 <b>0.86</b> 0.96	0.91 <b>0.72</b> 0.92	0.88 <b>0.78</b> 0.89	<b>1.00</b>

Note. PCLR: Psychopathy Checklist Revised; PCLR: F1: factor 1; F2: factor 2; f1: facet 1 (interpersonal); f2: facet 2 (affective); f3: facet 3 (lifestyle); f4: facet 4 (antisocial behaviour); CAPP: Comprehensive Assessment of Psychopathic Personality CAPP: A: attachment; B: behavioural; C: cognitive; D: dominance; E: emotional; S: Self. Underlined: negative score.

The correlation matrix (Table 2) should be analyzed from the perspective of the patterns arising in each group when comparing the results, rather than from the point of view of mere scores; since the group of women is much smaller their scores are lower due to a range restriction effect. This table shows how the correlation patterns of the total sample are maintained when the sample is separated

into men and women. While the PCL-R facets making up the factors correlate strongly with each other (facets 1 and 2, versus 3 and 4), the correlation with the facets of the other factor is weak. In women, the high correlation between facets 1 and 2 stands out. As expected, facet 1 (interpersonal) achieves the best correlation scores with the CAPP domains of Dominance and Self, and its weakest correlations

Table 3. *Univariate comparison between women and men on CAPP items, including domains and total score.*

	Women mean (SD)	Men mean (SD)	F	P
Attachment 18 detached	2.89 (1.61)	2.61 (1.77)	0.61	0.43
Attachment 8 uncommitted	3.14 (1.55)	2.56 (1.59)	3.17	<b>0.01</b>
Attachment 25 unempathic	2.03 (1.66)	2.00 (1.72)	0.01	0.93
Attachment 24 uncaring	2.17 (1.56)	2.26 (1.66)	0.06	0.80
Behavioural 3 lacks perseverance	1.75 (1.64)	1.88 (1.85)	0.12	0.72
Behavioural 26 unreliable	2.57 (1.55)	2.32 (1.87)	0.44	0.50
Behavioural 15 reckless	2.71 (1.58)	2.51 (1.70)	0.35	0.55
Behavioural 6 restless	2.60 (1.39)	2.02 (1.75)	2.75	0.09
Behavioural 17 disruptive	2.32 (1.44)	1.87 (1.65)	1.82	0.17
Behavioural 32 aggressive	1.57 (1.20)	1.61 (1.59)	0.02	0.89
Cognitive 19 suspicious	3.60 (1.59)	3.11 (1.77)	1.92	0.16
Cognitive 28 lacks concentration	1.75 (1.71)	1.34 (1.60)	1.51	0.22
Cognitive 7 intolerant	1.85 (1.38)	1.40 (1.55)	2.13	0.14
Cognitive 27 inflexible	2.17 (1.67)	1.97 (1.51)	0.44	0.51
Cognitive 29 lacks planfulness	2.57 (1.79)	2.07 (1.92)	1.64	0.20
Dominance 11 antagonistic	1.32 (1.15)	1.26 (1.44)	0.04	0.83
Dominance 12 domineering	2.14 (1.75)	1.69 (1.63)	1.75	0.18
Dominance 10 deceitful	2.89 (1.52)	2.44 (1.71)	1.72	0.19
Dominance 9 manipulative	3.14 (1.64)	2.55 (1.63)	3.16	0.07
Dominance 23 insincere	3.35 (1.33)	2.68 (1.67)	4.15	<b>0.04</b>
Dominance 30 garrulous	2.71 (1.65)	2.01 (1.58)	4.69	<b>0.03</b>
Emotional 5 lacks anxiety	3.42 (1.39)	2.67 (1.63)	5.3	<b>0.02</b>
Emotional 33 lacks pleasure	1.39 (1.06)	1.59 (1.61)	0.42	0.51
Emotional 4 lacks emotional depth	1.53 (1.29)	1.86 (1.72)	0.92	0.33
Emotional 31 lacks emotional stability	3.10 (1.25)	1.90 (1.74)	12.22	<b>0.01</b>
Emotional 16 lacks remorse	4.17 (1.27)	3.31 (1.69)	6.68	<b>0.01</b>
Self 20 self-centred	3.64 (1.63)	2.76 (1.99)	4.85	<b>0.02</b>
Self 14 self-aggrandising	2.53 (1.77)	1.79 (1.73)	4.36	<b>0.03</b>
Self 1 sense of uniqueness	3.03 (1.79)	2.22 (1.84)	4.72	<b>0.03</b>
Self 13 sense of entitlement	2.67 (1.72)	2.02 (1.66)	3.64	0.05
Self 22 sense of invulnerability	3.10 (1.66)	1.78 (1.67)	15.08	<b>0.01</b>
Self 2 self-justifying	3.89 (1.47)	3.29 (1.64)	3.29	<b>0.07</b>
Self 21 unstable self concept	2.00 (1.74)	1.18 (1.60)	6.02	<b>0.01</b>
CAPP Attachment	10.25 (5.22)	9.44 (5.87)	0.46	0.49
CAPP Behavioural	13.54 (6.75)	12.23 (8.50)	0.6	0.44
CAPP Cognitive	11.96 (4.19)	9.90 (5.99)	3.05	0.08
CAPP Dominance	29.21 (8.56)	24.00 (13.07)	4.15	<b>0.04</b>
CAPP Emotional	13.64 (2.88)	11.35 (6.22)	3.64	0.05
CAPP Self	20.89 (7.21)	15.08 (9.26)	10.03	<b>0.01</b>
CAPP total	99.50 (25.80)	82.03 (43.62)	4.24	<b>0.04</b>

Note. CAPP: Comprehensive Assessment of Psychopathic Personality. Bold: statistically significant results; SD: Standard deviation.

are with Behavioural and Cognitive for both groups. With regard to facet 2 (affective), and also for both groups, the scores indicate a better correlation with Attachment, Dominance, Emotional and Self, and the lowest was again with Behavioural and Cognitive. In this group of correlations, the relationship in the group of women between facet 2 of the PCL-R and the Attachment and Self domains of the CAPP stands out. For facet 3 (lifestyle), a strong correlation with the Behavioural dimension is observed in both groups, another somewhat less intense with Cognitive, and weak correlations with the rest of the CAPP dimensions. The same pattern is observed for facet 4 (antisocial behaviour). With regard to the CAPP dimensions, Attachment correlates strongly in both groups with Dominance, Emotional and Self. Behavioural and Cognitive correlate well with each other in both groups, and in men, but not in women, they correlate well with the other dimensions. Dominance stands out as the fundamental dimension for understanding the concept of CAPP psychopathy; it is the central dimension, the one that best correlates with all the

others in both groups. While Emotional and Self correlate well in men with all dimensions, their correlations in women with Behavioural and Cognitive lose potency.

Table 3 shows that at the level of univariate analysis, significant differences between men and women in the CAPP are fundamentally found in the dimensions of Dominance (total score and items 23 and 30), Emotional (items 5, 31 and 16), and especially Self (total score and items 20, 14, 1, 22, 2 and 21). A significant difference was also found in item 8, Attachment. All these significant differences indicate higher scores for women.

Table 4 indicates that the significant differences between men and women in the PCL-R at the level of univariate analysis are fundamentally found in impulsivity (items 10 and 11) and antisocial behaviour (facet 4); the scores in this case are significantly higher for men. Women scored significantly higher on one item, 17, which measures short-term marital relationships.

Overall, at the level of univariate analysis, the CAPP is seen to have greater capacity to distinguish between wom-

Table 4. Univariate comparison between women and men on PCL-R items, including factors, facets, and total score.

	Women mean (SD)	Men mean (SD)	F	P
PCL-R 1 glibness / superficial charm	1.00 (0.98)	0.71 (0.86)	2.59	0.10
PCL-R 2 grandiose sense of self-worth	0.92 (0.90)	0.73 (0.90)	1.06	0.30
PCL-R 3 needs stimulation / easily bored	1.21 (0.95)	1.31 (0.92)	0.30	0.58
PCL-R 4 pathological lying	0.92 (0.94)	0.86 (0.94)	0.10	0.75
PCL-R 5 deceitful / manipulative	1.53 (0.69)	1.47 (0.83)	0.15	0.70
PCL-R 6 lacks sense of remorse or guilt	1.67 (0.72)	1.57 (0.75)	0.47	0.49
PCL-R 7 shallow affect	0.60 (0.83)	0.72 (0.89)	0.45	0.50
PCL-R 8 callous / lacks empathy	0.75 (0.88)	0.86 (0.89)	0.39	0.53
PCL-R 9 parasitic lifestyle	1.21 (0.95)	0.97 (0.94)	1.50	0.22
PCL-R 10 poor behavioural self-control	1.28 (0.89)	1.66 (0.68)	6.68	<b>0.01</b>
PCL-R 11 sexual promiscuity	0.92 (1.01)	0.73 (0.94)	1.01	0.31
PCL-R 12 behavioural problems in childhood	0.60 (0.91)	0.64 (0.91)	0.04	0.85
PCL-R 13 lacks realistic long-term goals	0.96 (0.99)	0.92 (0.97)	0.04	0.84
PCL-R 14 impulsiveness	1.32 (0.83)	1.68 (0.65)	6.58	<b>0.01</b>
PCL-R 15 irresponsibility	1.60 (0.73)	1.72 (0.64)	0.73	0.39
PCL-R 16 unable to take responsibility for actions	1.82 (0.47)	1.58 (0.75)	2.60	0.10
PCL-R 17 frequent short-term marital relationships	0.53 (0.88)	0.22 (0.56)	6.23	<b>0.01</b>
PCL-R 18 juvenile delinquency	0.10 (0.41)	0.37 (0.75)	3.37	0.06
PCL-R 19 revocation of parole	0.28 (0.71)	0.54 (0.87)	2.23	0.13
PCL-R 20 criminal versatility	0.10 (0.41)	0.32 (0.71)	2.46	0.11
factor 1	9.25 (4.55)	8.54 (4.65)	0.57	0.45
factor 2	8.71 (5.24)	10.17 (5.05)	2	0.15
facet 1 interpersonal	4.39 (2.60)	3.79 (2.64)	1.26	0.26
facet 2 affective	4.85 (2.27)	4.75 (2.59)	0.04	0.83
facet 3 lifestyle	6.32 (3.58)	6.62 (3.08)	0.22	0.63
facet 4 antisocial behaviour	2.39 (2.14)	3.55 (2.46)	5.51	<b>0.02</b>
Total	19.32 (8.38)	19.60 (9.07)	0.02	0.87

Note. SD: Standard deviation; PCL-R: Psychopathy Checklist Revised. Bold: statistically significant results.

en and men compared to the PCL-R. This is already evident in the total scores, where the CAPP shows a significant difference in favour of women that does not exist in the PCL-R.

Eleven women (39.28%) scored 25 or more in the PCL-R, exceeding the European cut-off point, compared to 69 men (39.20%). The univariate comparison in this group of inmates yielded the following significant differences in favour of men, with the exception of item 17: poor behavioural self-control (item 10) ( $W = 436.5$ ,  $p = 0.036$ ), irresponsibility (item 14) ( $W = 465$ ,  $p < 0.01$ ), frequent short-term marital relationships (item 17) ( $W = 226.5$ ,  $p = 0.01$ ), juvenile delinquency (item 18) ( $W = 507.5$ ,  $p = 0.037$ ), revocation of probation (item 19) ( $W = 508.5$ ,  $p = 0.03$ ), factor 2 ( $W = 541$ ,  $p = 0.02$ ), facet 4 ( $W = 554$ ,  $p = 0.01$ ); and in the CAPP: no emotional depth (emotional 4) ( $W = 549$ ,  $p = 0.01$ ), higher for women in this case.

The results of the logistic regression are presented in Table 5. This table shows that only the variables PCL-R facet 4 and CAPP Self are statistically significant, while the variables CAPP Dominance and CAPP Emotional present  $p$  values below 0.25. The result yielded by the Homer and Lemeshow test of the goodness-of-fit of the proposed model shows that the obtained model fits reality.

Table 5. Logistic regression with sex of the individual as dependent variable, using PCL-R facets and the CAPP domains.

Variables	B	SE	OR (IC 95%)	gl	p
PCLR-Facet 1	-0.01	0.15	0.99 (0.74; 1.34)	1	0.98
PCLR-Facet 2	0.11	0.15	1.12 (0.82; 1.52)	1	0.45
PCLR-Facet 3	-0.03	0.11	0.96 (0.77; 1.19)	1	0.72
PCLR-Facet 4	0.53	0.16	1.69 (1.22; 2.35)	1	<b>&lt;0.01</b>
CAPP-Attachment	0.06	0.07	1.06 (0.92; 1.22)	1	0.35
CAPP-Behavioural	-0.02	0.04	0.97 (0.88; 1.07)	1	0.61
CAPP-Cognitive	-0.05	0.07	0.94 (0.81; 1.09)	1	0.42
CAPP-Dominance	0.07	0.06	1.08 (0.94; 1.23)	1	0.24
CAPP-Emotional	-0.10	0.08	0.90 (0.75; 1.07)	1	0.24
CAPP-Self	-0.12	0.04	0.87 (0.79; 0.96)	1	<b>&lt;0.01</b>

Note. PCLR: Psychopathy Checklist Revised; CAPP: Comprehensive Assessment of Psychopathic Personality; SE: Standard error; OR: Odds Ratio; CI: Confidence interval; df: Degrees of freedom.

Table 6 presents the results obtained from the repetition of the logistic regression model using as variables only PCL-R facet 4, CAPP Dominance, CAPP Emotional and CAPP Self, i.e., the variables that with  $p$  values below 0.25 in the original model. From the results obtained, it can be clearly observed how only the two variables identified as such in the first model continue to be significant. The Homer and Lemeshow test result also allows us to affirm that the model conforms to reality.

Table 6. Logistic regression model including the PCL-R and CAPP variables obtaining  $p$ -values below 0.2 in the global model.

Variables	B	SE	OR (IC 95%)	gl	p-value
PCLR-Facet 4	0.42	0.12	1.52 (1.20; 1.93)	1	<b>&lt;0.01</b>
CAPP-Dominance	0.08	0.05	1.09 (0.97; 1.22)	1	0.11
CAPP-Emotional	-0.08	0.06	0.91 (0.80; 1.04)	1	0.18
CAPP-Self	-0.12	0.04	0.87 (0.80; 0.95)	1	<b>&lt;0.01</b>

Note. PCLR: Psychopathy Checklist Revised; CAPP: Comprehensive Assessment of Psychopathic Personality; SE: Standard error; OR: Odds Ratio; CI: Confidence interval; df: Degrees of freedom.

To discover whether it is possible to differentiate between men and women based on the results obtained in the CAPP and PCL-R tests, models based on Support Vector Machines were subsequently applied. Firstly, a model was formed using the data corresponding to all the available individuals as information for its training, with all CAPP and PCL-R variables as input variables, and sex as output variables. The model obtained specificity and sensitivity values of 100%.

However, this result does not show that the Support Vector Machines model has any predictive capacity, simply that it is capable of correctly classifying the entire data set once 100% of the information is known. To reveal the predictive capacity of the model, and therefore to know whether it is possible to discriminate between men and women from the results in the CAPP and PCL-R tests, the data set is divided randomly into training and validation samples. Each of the training samples is made up of 66.66% of the available information, and the validation samples comprise the remaining 33.34%. Thus, of the total of 204 individuals who underwent both the CAPP and the PCL-R tests, 117 men and 20 women were random-

ly chosen for each training set. For each of the available kernels, the training and validation process was repeated 10,000 times. In the case of the linear kernel, the mean value obtained for sensitivity was 0% and 50% for specificity; for the polynomial kernel of grade 7 (the best of all grades), the sensitivity value was 22.22 % and specificity 35.59%; for the sigmoidal kernel the sensitivity value was 0% and specificity 47.46%, while, finally, for the radial kernel, the mean sensitivity value was 0% and specificity 50%. The confusion matrix for the grade 7 polynomial kernel indicated the following degrees of real prediction: Men - Men [44.45 (44.37 - 44.52)], Men - Women [6.35 (6.32 - 6.38)], Women - Men [14.55 (14.47; 14.62)] and Women - Women [2.64 (2.61, 2.67)].

These results indicate that, based on the CAPP and PCL-R variables, it is very difficult for the Support Vector Machine model to distinguish women, a minority group, from men in this sample.

## Discussion

The social and demographic variables analyzed indicate that neither group, women or men, presents significant differences that could function as confounding variables for the subsequent analysis. The differences regarding the consumption of toxins are balanced. The use of alcohol and cannabis, greater in men, is very common throughout the sample. In this sample, alcohol is linked only weakly to antisocial behaviours and psychopathy, whereas the opposite is true of cannabis. Moreover, there are no significant differences with respect to the substances most linked to criminal behaviour, morphic derivatives and stimulants such as cocaine and amphetamines. Finally, the difference between women and men in terms of PD has been already described in previous studies (Carabellese et al., 2019; Dolan & Vollm, 2009; Gray & Snowden, 2016; Guay et al., 2018; Nicholls et al., 2005; Thomson, 2017; Verona et al., 2013; Wynn et al., 2012). Men present a higher incidence of APD, the PD most related to criminal behaviour, while women presented a higher incidence of disorders related to the absence of empathy and to arrogant and grandiose interpersonal styles, that is, narcissistic, borderline, and histrionic. Dependent PD, also more prevalent in women, is not very frequent in the sample. It should be remembered that, despite these significant differences in the prevalence of personality disorders, there are none linked to the commission of crimes.

The correlation matrix shows a very similar development in terms of PCL-R and CAPP scores in both groups. The correlations between PCL-R factors and facets and CAPP dimensions present a very similar distribution and grouping. In women, the high correlation between PCL-R facet 2 and the CAPP's Attachment and Self domains stands out. In men, on the other hand, the Behavioural and Cognitive

CAPP dimensions correlate more strongly with the other dimensions of the same instrument.

The multivariate analysis extends previous findings in showing that the CAPP, especially its Emotional, Dominance and Self dimensions, makes it possible to differentiate men from women, with the latter obtaining significantly higher scores. The PCL-R, for its part, allows discrimination between genders fundamentally through facet 4, anti-social behaviour, which is significantly higher in men, as reported in previous studies (Carabellese et al., 2019; Dolan & Vollm, 2009; Gray & Snowden, 2016; Guay et al., 2018; Nicholls et al., 2005; Thomson, 2017; Verona et al., 2013; Wynn et al., 2012). The results of the PCL-R are consistent with previous research, but those of the CAPP, which are more innovative, indicate that the assessment of psychopathy in women would be undervalued were the PCL-R not completed with this other instrument, more sensitive in its assessment of the psychopathology of personality. The fact that there are no significant differences in the prevalence of violent crime, nor in the percentage of men and women exceeding the European cut-off point for psychopathy in the PCL-R (a score of 25 or higher) reinforces the importance of these findings.

The univariate analysis of inmates with a PCL-R score of 25 or above provides another finding of great interest. Facet 4 again exhibits a significant difference between women and men, with the latter scoring higher. This difference indicates the importance of the facet in the PCL-R scores in the male sample. To enter the psychopathy range, men need high scores in this facet, while women, compared to men, achieve psychopathic level scores in a more balanced way across facets. In other words, to be considered psychopathic from the PCL-R point of view, men usually have to be highly antisocial but women do not. Unfortunately, the PCL-R cut-off point cannot be extrapolated to the CAPP, and the CAPP does not have its own cut-off points. For this reason, we cannot firmly state that the CAPP dimensions do not show significant differences between more psychopathic women and men, but that they simply do not show them when a cut-off point of 25 is used in the PCL-R. It is essential in PDs of a dimensional and non-categorical nature to avoid confusing a cut-off point with a diagnosis.

Logistic regression confirms that facet 4 of the PCL-R in men and the Self domain of the CAPP in women are the variables which, at the level of facets and domains, most discriminate between genders. Once again, the importance of combining the assessment of the PCL-R with that of the CAPP can be appreciated.

The question arises of how to interpret the inability of the Support Vector Machine Model to discriminate between men and women. One possibility could be that the sample of women was insufficient; another alternative is that the significant variables indicated so far did not have enough power to meet this last requirement level. This lat-



ter hypothesis would point to the impossibility of creating a predictive model to differentiate women from men using the PCL-R together with the CAPP in assessing psychopathy. In other words, we could not show clinical and forensic staff that facet 4 of the PCL-R, based on a certain score, allows males to be detected in a sample, or conversely, females using the Self domain of the CAPP. This does not invalidate the results obtained previously in univariate analysis and logistic regression. It is not surprising that there is no variable in the CAPP or the PCL-R that, based on its score, allows women to be differentiated from men; after all, previous research has not established that there is a symptom, signal, behaviour or crime that cannot be present in its maximum intensity in both women and men.

This study has limitations. It was previously mentioned that the number of women in this sample is representative but small. To achieve greater statistical power, it would be necessary to increase the number of women in the sample. This poses a problem because ensuring that the sample is not one of convenience and remains representative of the Spanish prison population means that the number of men included would also have to increase proportionally, thus complicating the study and making it more expensive. Secondly, although the researchers aimed to keep the results of the psychopathy assessment instruments blinded from the PDs of the rest of the socio-demographic, consumption and crime variables, given that the PCL-R, CAPP and IPDE require an interview to be carried out, it is possible that some of the inmates would involuntarily break the blind during the interviews.

In conclusion, this study shows that there are significant differences between women and men when the same instruments are applied in the assessment of psychopathy and both groups are balanced regarding substance use. Women present more psychopathology of the personality than men, especially with regard to the self, and to a lesser extent emotional disturbances and dominance. Therefore, in this sample, narcissistic, borderline and histrionic PDs are more frequently present in women. It is essential to remember that the CAPP is the instrument that captures this difference clearly, not the PCL-R. In contrast, men have a higher prevalence of antisocial behaviours compared to women, and are therefore diagnosed more often with APD. Again, it is essential to indicate that in this case the difference is detected with the PCL-R and not with the CAPP. Given the above, it is necessary to remind clinical and forensic staff that in order to capture these gender differences clearly when assessing psychopathy, they must combine the instruments, since the use of only the PCL-R would involve losing the ability to capture part of the psychopathological differences that exist between women and men. Despite these differences, the construct of psychopathy is very similar in both genders, with no symptom or item that clearly discriminates between women and men.

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## Conflict of interests

The authors declare no conflict of interest in relation to the conduct of this study.

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Desde el año 2012 sólo se admite la normativa APA.

Ante la preparación de un artículo de cara a su publicación se deben revisar y aplicar las normas extensas, que pueden ser consultadas en [www.adicciones.es](http://www.adicciones.es)

Adicciones está editada por Socidrogalcohol, Sociedad Científica Española de Estudios sobre el Alcohol, el Alcoholismo y otras Toxicomanías. Adicciones publica artículos originales sobre el tratamiento, la prevención, estudios básicos y descriptivos en el campo de las adicciones de cualquier tipo, procedentes de distintas disciplinas (medicina, psicología, investigación básica, investigación social, etc.). Todos los artículos son seleccionados después de pasar un proceso de revisión anónimo hecho por expertos en cada tema. Adicciones publica 4 números al año. Adicciones tiene las secciones de editorial, artículos originales, informes breves, artículos de revisión y cartas al director. La revista se publica en español, aunque admite artículos en inglés. Cuando publica un artículo en inglés, puede exigir su traducción también al español, pero no es la norma.

**Papel.** La revista Adicciones está impresa en papel estucado fabricado con pastas libres de cloro (TCF).

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**Autoría.** Es muy importante que únicamente se consideren autores aquellos que han hecho sustanciales contribuciones: 1) a la concepción y diseño, adquisición de datos, o el análisis e interpretación de datos; 2) a la redacción del artículo o a su revisión crítica; y 3) que ha dado su aprobación de la versión que se publicará. Los autores deben asegurarse de que partes significativas del material aportado no ha sido publicado con anterioridad. En caso de que puedan tener dudas sobre el cumplimiento de esta norma, deberán presentar copias de lo publicado o de lo presentado para publicación a otras revistas antes de poder ser considerado el artículo para su revisión. En caso de dudas sobre alguno de los aspectos anteriores los autores deben consultar el acuerdo de Farmington al que está adherida la revista Adicciones (Anexo 1), las normas de "Sponsorship, authorship, and accountability" del International Committee of Medical Journal Editors ([www.icmje.org/sponsor.htm](http://www.icmje.org/sponsor.htm)) o las normas de publicación de la American Psychological Association, 6ª edición (2010) ([www.apastyle.org](http://www.apastyle.org)). El editor de la revista puede dirigirse a los autores del artículo para que especifiquen cual ha sido la contribución de cada uno de ellos.

**Preparación de manuscritos.** Los autores deben seguir exclusivamente para la presentación de sus manuscritos las Normas de Publicación de la American Psychological Association (6ª edición, 2010; <http://www.apastyle.org>). Las excepciones a esta regla son mínimas y dependen sólo de las diferencias que puede haber en el uso del español y del inglés. Por ejemplo, los ingleses utilizan en la bibliografía el signo '&' antes del último autor, mientras que en español dicho signo se corresponde exactamente con la 'y' (por tanto los artículos en español utilizarán solo la 'y'); otra diferencia puede ser en los títulos de los artículos, puesto que en inglés se pone en mayúscula la primera letra de muchas de las palabras, mientras que en español sólo ponemos la primera...

NO existe un límite exacto de palabras para los trabajos que se presenten. Pero deberá cuidarse mucho que toda la información que se incluya sea estrictamente la necesaria.

Es importante que los artículos sean interesantes para la comunidad científica del campo de las adicciones. Se evitarán trabajos que se refieran a realidades muy concretas –a menos que precisamente en ello resida su interés–, o que sean básicamente descriptivos –a menos, nuevamente, que se trate de algo novedoso.

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**Informes breves.** En esta sección se considerarán los trabajos de investigación que por sus características especiales (series con número reducido de observaciones, casos clínicos, trabajos de investigación con objetivos y resultados muy concretos, estudios epidemiológicos descriptivos, primeros resultados de un estudio amplio, etc.) pueden ser publicados de forma abreviada y rápida.

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**Introducción.** Será breve y deberá proporcionar sólo la explicación necesaria para que el lector pueda comprender el texto que sigue a continuación. No debe contener tablas ni figuras, a menos que sean imprescindibles para la comprensión del texto. Debe incluir un último párrafo en el que se exponga de forma clara el o los objetivos del trabajo. Siempre que se pretenda publicar una observación muy infrecuente, debe precisarse en el texto el método de pesquisa bibliográfica, las palabras claves empleadas, los años de cobertura y la fecha de actualización.

**Métodos.** Se describirá claramente la metodología empleada (selección de la muestra, como se recogieron los datos, instrumentos de recogida de datos o de evaluación, temporalización,...). Se deben identificar los métodos, instrumentos de evaluación, tratamientos, fármacos utilizados, aparatos, sistema de evaluación, pruebas estadísticas si son novedosas, métodos nuevos, etc. Debe especificarse el tipo de estudio (descriptivo, epidemiológico, experimental, ensayo clínico, etc.), sistema de asignación de los sujetos a grupos, aleatorización, etc. Cuando haya un protocolo debe citarse. Cuando los experimentos son realizados con animales o el ensayo es experimental en humanos debe especificarse explícitamente que se han seguido las normas éticas deontológicas, de investigación y que se han cumplido los convenios internacionales de experimentación animal o humana. Debe especificarse el tipo de análisis estadístico que se va a utilizar, describirlo cuando éste sea nuevo o poco conocido, e indicar el paquete estadístico que se va a utilizar. Se valorará positivamente si se ha conseguido la aprobación del estudio por algún comité ético o se podrá exigir cuando el estudio realizado lo requiera.

**Resultados.** Los resultados deben presentarse en una secuencia lógica en el texto, tablas y figuras. Utilice sólo aquellas tablas y figuras estrictamente necesarias, que expresen claramente los resultados del estudio. No duplique los datos en tablas y figuras. No repita en el texto todos los datos de las tablas y figuras, sólo los más importantes. Enfatice y resume sólo las observaciones más importantes. Adicciones adopta el sistema convencional del 5% como valor para la significación estadística y no acepta tener en cuenta las tendencias para valores menores.

Los ensayos clínicos aleatorizados deben adecuarse a las guías CONSORT ([www.consort-statement.org](http://www.consort-statement.org)) y los estudios con diseños no experimentales a las guías TREND ([www.trend-statement.org/asp/trend.asp](http://www.trend-statement.org/asp/trend.asp)) para la mayor claridad de los lectores y revisores del trabajo. Igualmente, se presentarán los estadísticos del tamaño del efecto.

**Discusión.** Enfatizará los aspectos nuevos e importantes del estudio y las conclusiones que se derivan del mismo. No repita en detalle los resultados que ha presentado en la sección anterior ni en la introducción. Destaque lo más importante y controvertido y relacionelo con otros estudios relevantes sobre el tema. No haga suposiciones si no se ven apoyadas por los datos. Cuando sea apropiado pueden incluirse recomendaciones. Indique las implicaciones de sus hallazgos y sus limitaciones (estas preferiblemente formarán un párrafo al final del artículo).

**Reconocimientos.** Este apartado se situará al final del texto del artículo y justo antes del apartado de Referencias. Cuando se considere necesario se citará a las personas, centros o entidades que hayan colaborado o apoyado la realización del trabajo. Pueden incluirse todas aquellas personas que hayan ayudado en la preparación del artículo, pero no con la intensidad requerida para ser considerados autores. Si el trabajo ha sido financiado se indicará la entidad financiadora.

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### Internet, video game and mobile phone addiction in children and adolescents diagnosed with ADHD:

**A case-control study**

*Adicción a Internet, videojuegos y teléfonos móviles en niños y adolescentes: Un estudio de casos y controles*

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*El programa multicomponente de apoyo para el cese del tabaquismo (McSCSP) es efectivo en pacientes con trastorno mental grave sin diferencias de género*

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