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INCREASED VALUE OF SUBSTANCES OR DECREASING ALTERNATIVES? BEHAVIORAL ECONOMICS IN THE TIME OF COVID-19

¿INCREMENTO EN EL VALOR CONCEDIDO A LAS SUSTANCIAS O DISMINUCIÓN EN LAS ALTERNATIVAS? ECONOMÍA CONDUCTUAL EN TIEMPOS DE LA COVID-19

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COVID-19 offers a chance to test the Reinforcer Pathology (RP) model through the effects of social constraints on the motivation to use drugs. *Aims*. This study aimed to empirically assess the RP model in the context of a cross-sectional online survey in Spain. *Method.* During the strictest period of confinement (14th March-12th April 2020), 203 participants provided measures on past 30-day use of legal and illegal substances and responded to hypothetical alcohol and cigarette purchase tasks. Univariate and bivariate analyses were conducted to inform on pre- and intra-pandemic substance use patterns. Breakpoint (i.e., price at which consumption ceases), elasticity (i.e., sensitivity of demand to rises in costs) and intensity (i.e., unrestricted consumption) were used as indicators of substance use demand. *Results*. Past 30-day alcohol use decreased from 71.4% (145/203) to 50.7% (103/203), tobacco from 14.3% (30/203) to 12.8% (26/203), and cannabis from 8.9% (18/203) to 4.4% (9/203). Predictably, illegal substance use went from 1% (2/203) to 0%. *Conclusions.* Despite reductions in substance use, alcohol and tobacco reinforcement, as measured by intensity and breakpoint, slightly increased within the first month of confinement. Potentially beneficial nudges and intervention strategies are discussed from the preventive and treatment standpoint.

Keywords: behavioral economics; COVID-19; drug demand; substance use.

La COVID-19 ofrece una oportunidad para evaluar el modelo de la Patología del Refuerzo (PR) mediante el estudio de las restricciones sociales y la motivación hacia el uso de sustancias. *Objetivos:* Este estudio evaluó empíricamente el modelo de la PR en el contexto de una encuesta transversal online. Métodos: Durante el período 14 de marzo-12 de abril 2020, 203 participantes informaron del consumo de sustancias legales e ilegales en el último mes. Se analizaron los cambios en el consumo durante el confinamiento. Se utilizaron distintos indicadores de demanda de sustancias: *Breakpoint* (i.e., precio al que el consumo cesa), elasticidad (i.e., sensibilidad de la demanda a incrementos en el coste) e intensidad (i.e., consumo en contextos de no restricción). *Resultados*: El consumo de alcohol en el último mes disminuyó del 71.4% (145/203) al 50,7% (103/203), el de tabaco del 14.3% (30/203) al 12.8% (26/203), y el de cannabis del 8.9% (18/203) al 4.4% (9/203). El uso de sustancias ilegales pasó del 1% (2/203) al 0%. *Conclusiones*: Se observaron reducciones en el uso de sustancias y un ligero incremento en el nivel de reforzamiento (intensidad y *breakpoint*) asociado al uso de alcohol y tabaco. Se discuten estrategias preventivas (*nudges*) y de tratamiento.

Palabras clave: economía conductual; COVID-19; demanda de drogas; uso de sustancias.

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The impact of COVID-19 is not uniform across the globe. According to the Johns Hopkins Coronavirus Resource Center, in Spain, COVID-19 has caused more than 1,046.132 infections and 34,752 deaths at the time of writing of this report. Spain has become the second European country in undertaking the strictest containment measures, reaching a score of 89.41/100 (Hale, Webster, Petherick, Phillips, & Beatriz, 2020).

In Spain, since the declaration of the 'State of Alarm' (14th March 2020), social contact was prohibited and all non-essential economic activity was suspended as of 30th March, leading to the furlough of more than four million workers. A concern is that self-isolation seriously impacts individuals' health at multiple levels, including mental health (Chacón-Fuertes, Fernández-Hermida, & García-Vera, 2020; Inchausti, García-Poveda, Prado-Abril, & Sánchez-Reales, 2020) and risk behaviors such as substance use (García-Álvarez, Fuente-Tomás, Saíz, García-Portilla, & Bobes 2020). Also, financial difficulties may increase substance use among vulnerable populations (Dom et al., 2016).

Previous works have examined the impact of the lockdown, and the COVID-19 pandemic more broadly, in several psychosocial domains (e.g., mental health, distress, and financial impacts) in both the general and clinical populations (Dubey et al., 2020; Luo, Guo, Yu, & Wang, 2020). Increased levels of depression, anxiety or post-traumatic stress disorder have been reported in Spain (Garre-Olmo et al., 2020; González-Sanguino et al., 2020). Unfortunately, the impact of the pandemic in substance use remains as an under-researched area in Spain. Aside from increased risk of contracting COVID-19, individuals who use substances are more vulnerable to increase their levels of use and relapse due to coping motives (Columb, Hussain, & O'Gara, 2020). However, a recent report from the Spanish National Plan on Drugs (DGPNSD & EMCDDA, 2020) has informed on general decreases across substances; lower availability, accessibility, and health-related worries seem to be on the basis of the observed changes.

The current context offers a genuine experiment to examine the effects of social constraints on substance use, and increase knowledge on ways to prevent its onset, escalation, and relapse. Reinforcer Pathology (PR), a model stemmed from Behavioral Economics (BE) has provided fruitful insights on the understanding of substance use (González-Roz, Secades-Villa, Martínez-Loredo, & Fernández-Hermida, 2020). RP posits that individuals vulnerable to, or already, suffering from addictions show: (1) an excessive valuation of the substance, and/or (2) a disproportionate preference for instant reinforcers over larger and objectively more valuable ones (i.e., Delay Discounting, DD). BE research has developed a plethora of methods to assess these two central concepts in different populations and complex marketplaces, constraint situations like natural disasters, and clinical contexts. One example is the hypothetical purchase task to assess substance use demand (e.g., Alcohol Purchase Task, APT).

From a preventive standpoint, identifying which RP variables predict the onset, progression or relapse into substance use becomes relevant. Interventions that focus on reducing the reinforcing value and increasing non-substance using activities can also be enhanced by insights provided by the RP model (Meshesha et al., 2020). Based on Premack's principle, this model suggests that scarcity situations may increase the reinforcing efficacy of drugs and, therefore, its demand (Bickel & Athamneh, 2020).

What follows is an empirical assessment of this model to explore changes in substance use demand, and a discussion on how BE can inform ways to prevent and address risk patterns of substance use. The goal of the current study was characterizing the impacts of the COVID-19

lockdown on substance use changes during the earliest stage of the confinement in Spain (14th March-12th April 2020), and to delve into the tenets of the RP model to advance our understanding of substance use during stress-related situations, such as the one currently experienced. Implications for the prevention and treatment fields are discussed in the context of an online survey conducted in Spain, which gathered data retrospectively on the month before the onset of the State of Alarm and during the period of the strictest containment measures.

Method

Design and participants

Participants were 203 individuals [% females: 73.4, mean age: 31.22 (*SD*= 12.68)] recruited through a snowball sampling using an online survey built with *Google Forms*, a freely available platform. Following the abovementioned procedure, the research team sent the survey link to the participants using social media networks (i.e., Facebook, WhatsApp, and Twitter). The study was intended to examine changes in substance use during the confinement using a retrospective design, so most of the questions were keyed to either the past 30 days prior the confinement or the first 30 days after its onset. Accordingly, no stringent criteria were considered, and all adults (i.e., ≥ 18 years old) living in Spain during the month prior to the onset of the State of Alarm and the confinement were invited to participate in this study. Data collection took place between April 14 and May 13, 2020 and the study protocol was approved by the ethics committees of the Miguel Hernandez University of Elche (Ref: DPS.JCC.02.20) and the Research ethics committee of the Principality of Asturias (Spain). All participants were presented an informed consent before taking part in the survey.

Measures

Sociodemographic measures (e.g., sex, age) were collected to characterize the study sample. All participants were asked to indicate their substance use status within the month prior to the onset of the confinement and during the first thirty days of self-isolation. Those reporting past 30-day alcohol and/or tobacco use in either assessment period (i.e., prior to or during the confinement) were asked to complete alcohol/cigarette hypothetical purchase tasks (for further details on APT and CPT reliability properties, see González-Roz, Secades-Villa, Weidberg, Muñiz, & MacKillop 2020; Murphy & MacKillop, 2006). These measures have adequate psychometric properties and allows to accurately assess the relationship between price (i.e., economic, and personal costs) and demand (i.e., commodity consumption). Purchase tasks provide five demand indices: intensity (i.e., demand when no restrictions on costs exist), Omax (i.e., maximum level of consumption, as measured in units), Pmax (i.e., price associated to the maximum consumption), breakpoint (i.e., price at which consumption ceases), and elasticity (i.e., sensitivity to rises in unit costs). The breakpoint, intensity, and elasticity were considered in this study considering both the study aims and reports that conclude their adequate psychometric properties (Kiselica, Webber, & Bornovalova, 2016; Zvorsky et al., 2019).

Data analysis

Descriptive statistics (means, frequencies) were conducted to characterize the COVID-19 in terms of sociodemographic characteristics. Substance use changes from pre- to intra-pandemic were also examined through McNemar's chi-square and paired-sample *t*-tests.

Substance use demand indicators (from the APT and CPT) were calculated following a stringent data analysis procedure. First, raw data were individually examined to detect any outlier value (Z>4.00). Outlying cases were replaced to one unit higher than the next non-outlying value. This procedure was also adopted to correct for outliers in the APT and CPT observed indicators: intensity, breakpoint, elasticity. This latter index was calculated using the exponentiated equation described in Koffarnus, Franck, Stein, and Bickel (2015).

Results

Participants' characteristics are displayed in Table 1. Most participants were female, aged 31.22 on average, and endorsing high school academic level (50.74%). Substance use significantly decreased during the confinement. Past 30-day alcohol use decreased from 71.4% (145/203) to 50.7% (103/203) [p <.001], tobacco from 14.3% (30/203) to 12.8% (26/203) [p <.001], and cannabis from 8.9% (18/203) to 4.4% (9/203) [p = .022]. Predictably, illegal substance use went from 1% (2/203) to 0%. Daily cigarette use increased, although not statistically, by approximately one unit (M = 5.49, SD = 4.38 vs. 6.51, SD= 5.31, t(24)=-.035, p =.97) while cannabis remained quite similar (M = 1.48, SD = 1.30 vs. M = 1.39, SD = 1.17, t(6)= .55, p =.60). Of the substances assessed, alcohol showed more variability in patterns of use: 7.9% (n = 8) did not change their consumption, 50.5% (n = 51) decreased their alcohol use and 41.6% (n = 42) increased the number of daily standardized units[1], with the average increase being two units per day.

Table 1

Demographic characteristics of the study sample (N = 203)

Female sex: n (%)	149 (73.4)
Age : *M* (*SD*)	31.22 (12.68)
Education level: n (%)	
<High School	3 (1.5)
High School	103 (50.74)
≥University	97 (47.78)
Monthly income level: n (%)	
≤€900	111 (54.7)
€901-1,000	10 (4.9)
€1,001-1500	28 (13.8)
€1,501-2,000	25 (12.3)
≥€2,001	29 (14.3)
Employment status: n (%)	
Unemployed	43 (21.2)
Working as usual (on-site)	34 (16.7)

[1] One unit of alcohol in Spain (UBE in Spanish) is the equivalent of 10g of alcohol.

Working remotely	49 (24.1)
Dependants at home: n (%)	39 (19.2)

Figure 1 shows pre-post confinement alcohol and tobacco demand as per purchases tasks. These two measures were used to simulate typical daily consumption prior to the confinement and the actual status in self-isolation. Through the relationships between price and demand, it is possible to yield an estimation of the reinforcing value of each substance. The reinforcement of tobacco and alcohol increased slightly, though not statistically, as evidenced by higher intensity of tobacco and alcohol: 30-days prior to the confinement [tobacco: *M* = 10.41 (*SD* = 6.15); alcohol: *M* = 3.76 (*SD* = 2.67)]; past 30 days of the confinement [tobacco: *M* = 13.24 (*SD* = 12.14); alcohol: *M* = 4.11 (*SD* = 3.64)].

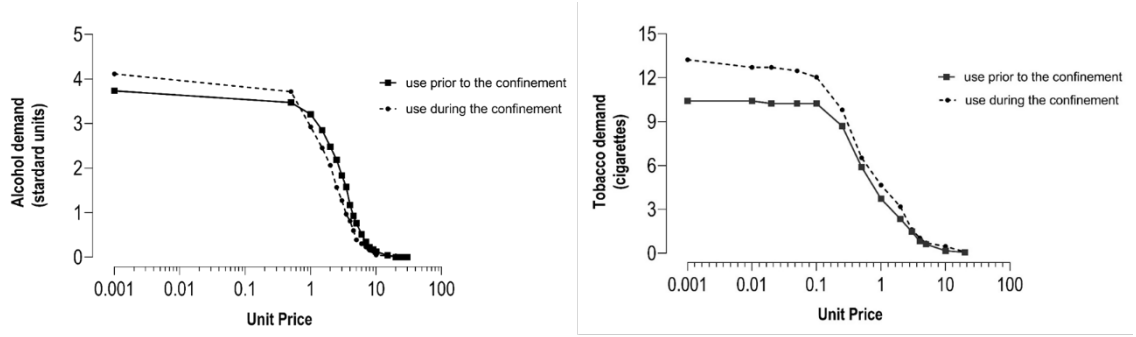

Figure 1. Alcohol (left) and tobacco (right) demand are shown for the time prior to and during the confinement

It is noteworthy that APT elasticity (i.e., sensitivity to rises in costs) and breakpoint (i.e., price at which consumption ceases) were respectively lower and higher among individuals increasing (elasticity: *M* = .023, *SD* = .022; breakpoint: *M* = 5.08, *SD* = 3.50) vs. those decreasing (elasticity: *M* = 0.42, *SD* = .037; breakpoint: *M* = 3.37, *SD* = 1.85) their quantity of alcohol use (all *p* values <.039). Interestingly, these variables did not differ between groups before the confinement, all *p* values ≥ .38.

Discussion

Consistently with the recently published results on the European Web Survey on Drugs (DGPNSD & EMCDDA, 2020), levels of past 30-day legal and illicit substance use significantly decreased during the confinement. Nonetheless, perceived reward from using alcohol increased among individuals increasing their quantity of alcohol use during the confinement.

Contextual characteristics might explain the decreased levels of substance involvement, particularly for alcohol. Beyond its reinforcing properties, alcohol use is maintained by social reinforcers (Acuff, Soltis, & Murphy, 2020), and restrictions during the confinement may have impacted on one of the most common drinking motives (DGPNSD & EMCDDA, 2020). In addition, a number of nudges have been used to improve diet, physical activity and adequate behaviors to prevent individuals from getting infected with COVID-19, which may also explain the observed reduction. These nudges consisted of relevant messages targeted to the general population,

including exercise and educational programs on public TV channels, and the promotion of social contact through digital media. Also, different associations and therapeutic communities have enhanced their services by offering online support and informative preventive measures to avoid using substances. Notwithstanding, they were mostly focused on patients undergoing outpatient or inpatient treatments with less attention being paid to the general populations.

Both breakpoint and inelasticity increased significantly in those showing more alcohol use during the pandemic, even when pre-covid alcohol reinforcement levels did not differ in the group increasing versus decreasing their alcohol use. Empirical studies have shown that a particular constituent of RP, DD, can predict substance use onset and more severe substance use patterns longitudinally (Martínez-Loredo, Fernández-Hermida, De La Torre-Luque, & Fernández-Artamendi, 2018). The reinforcing value of alcohol seems to be rather a resulting effect of substance use (Martínez-Loredo, González-Roz, Secades-Villa, Fernández-Hermida, & MacKillop, 2020) that is influenced by other environmental variables such as the availability of alternative non-substance use reinforcers (e.g., restricted access to pleasant outdoor activities) (Murphy, Correia, Colby, & Vuchinich 2005) and drinking motives (Dennhardt, Murphy, McDevitt-Murphy, & Williams, 2016). In the context of this study, results suggest that higher engagement of social and drinking-to-cope motives might arguably have led those more psychologically affected by the COVID-19 pandemic to use alcohol in higher quantities. In view of the high breakpoint and low elasticity observed during the confinement, it is expected that the escalating group may need more targeted messages or more intensive treatments. In this regard, ongoing public health campaigns should use gain-framed messages and incentives for encouraging engagement in non-substance using behaviors. Several platforms are freely available that can be adapted outside US contexts, and widely promoted through the Spanish community (e.g., *weconnect and stickk* platforms).

From a treatment standpoint, it seems relevant reaching not only individuals with substance use disorders, but also those with low-moderate levels of use, as they might also be vulnerable to escalating levels in stress-related situations. Lockdown results in social isolation and increased mental health distress. Collectively, results suggest that the increased demand may be derived from reductions in the availability of non-substance using activities rather than from an 'absolute' increase in the value of alcohol, as evidenced by lower consumption levels during the confinement. However, results become speculative in the absence of an appropriate assessment of activity levels and further research is warranted to further elucidate this aspect. Notwithstanding, there is evidence supporting the efficacy of behavioral activation-based interventions that suggest increasing the number of positive and pleasant activities might lead to decreased substance use and anxiety/depression symptomatology (Martínez-Vispo, Martínez, López-Durán, Fernández del Río, & Becoña, 2018).

The observed results must be interpreted in the context of several limitations. First, far from pretending to be an epidemiological study, this report was intended to contribute to ongoing efforts aimed at examining the impacts of the pandemic in substance use. An empirical assessment of the RP framework to explore changes in substance use demand during the COVID-19 pandemic was presented. Given the results mentioned and the emerging literature on this topic, the RP model might be considered valuable to identify populations at risk of escalating their use of substances and inform about treatment outcomes (e.g., substance and non-substance related reinforcement). Further large-scale studies that test the potentiality of the RP to predict longitudinal changes in substance use are encouraged.

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Conflict of interest

The authors declare that there is no conflict of interest.

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