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ORIGINAL ARTICLE

Cannabis and Synthetic Cannabinoids Are Used for Different Reasons: Comparing Functional Motives of Use Based on the European Web Survey on Drugs

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Abstract
Synthetic cannabinoids (SCs) first emerged in Europe during the 2000s, becoming widely accessible over the 2010s. Despite their known high health risks, little is understood about users' motives for choosing SCs. The 2021 European Web Survey on Drugs (EWSD) reached 48,427 valid respondents from 22 European countries who use drugs. Motives of cannabis and synthetic cannabinoid use were compared while controlling for age and gender effects by logistic regression. Among participants, 93.1% reported last year cannabis use and 4.1% last year synthetic cannabinoid use. The motives of reducing stress, getting high, and enhancing performance and curiosity proved to be more pronounced in the case of cannabis use than in the case of the use of SCs, while the motivation of reducing pain/inflammations was more pronounced in the case of SC use. The findings indicate distinct functional motives underlying the use of cannabis and SCs, demonstrating that SCs serve different needs than cannabis and can no longer be regarded as its substitute. While curiosity was a predominant motive for SC use in the early 2010s, the primary drivers of use shifted by the early 2020s.

Keywords New psychoactive substances · Synthetic cannabinoids · Cannabis · Motives for drug use · Web survey

Synthetic cannabinoids (SCs) appeared in Europe in the 2000s and became widely available in the 2010s. Unlike organic cannabinoids found in herbal cannabis and cannabis resin, SCs have distinct chemical structures but bind to the same CB receptors in the brain. However, compared to organic cannabinoids, SCs are known for producing more severe

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and unpredictable psychotropic effects (Cohen & Weinstein, 2018; van Amsterdam et al., 2015). The difference in their effects is partly explained by the higher potency of most SCs (Cohen & Weinstein, 2018; EMCDDA, 2023a) and the absence of cannabidiol (CBD) in these substances that help to moderate the unwanted effects and negative consequences of psychotropic organic cannabinoids when used in herbal cannabis or cannabis resin (Iseger & Bossong, 2015; van Amsterdam et al., 2015). SCs are frequently marketed as legal alternatives or replacements to cannabis (organic cannabinoids) (Pulver et al., 2023). In order to enhance the feeling of similarity, producers impregnate dried herbal materials with SCs to achieve a visual resemblance. To date, more than 240 different SC compounds have been identified by European authorities and reported to the European Union Drugs Agency (EUDA) (EMCDDA, 2023b).

The appearance, use, and negative consequences of the new psychoactive substances (NPS), among them SCs, have been a major concern in Europe in the past 15–20 years (Corazza et al., 2013a; Corazza et al., 2013b; EMCDDA, 2023c; Spaderna et al., 2013). Experimenting with NPS attracted many in the adult population and in the schoolchildren as well. NPS are frequently mislabelled or contaminated, and compounds available on the streets fluctuate dynamically. Therefore, users lack reliable information on the actual substances purchased (EMCDDA, 2021a). Due to the above complexity of the NPS market and therefore the difficulty of measuring NPS use based on self-reported data, there is still scarce internationally comparable data that would allow the identification of trends in Europe. The ESPAD study estimated that 4% of schoolchildren aged 15–16 used NPS in 2015 (ESPAD Group, 2016), while 3.4% in 2019 (ESPAD Group, 2020).

During the early 2010s when the spread of SCs was still a relatively new phenomenon, there were many attempts to understand why people turn to these substances. Among the major motives of using or trying SCs primarily circumstantial factors, such as "availability" (Loeffler et al., 2016; Winstock & Barrat, 2013), "affordability" (Winstock & Barrat, 2013), "undetectability" (Barratt et al., 2013; Bonar et al., 2014; Loeffler et al., 2016; Smith & Staton, 2019; Winstock & Barrat, 2013), "legal status" (Barratt et al., 2013; Winstock & Barrat, 2013), and "positive review from peers" (Loeffler et al., 2016) were identified. Some studies also identified functional motives just like "curiosity" (Barratt et al., 2013; Bonar et al., 2014; Loeffler et al., 2016) "feeling good/getting high" (Bonar et al., 2014), "relaxation" (Bonar et al., 2014), or "effects" (Barratt et al., 2013; Loeffler et al., 2016; Winstock & Barrat, 2013). In more recent studies, SC use was associated with the motive of "coping" (Benschop et al., 2020) and the motives of "experiences" (Wieczorek et al., 2022). Given that synthetic cannabinoids (SCs) have been present on European drug markets for two decades, a substantial body of both scientific knowledge and user experience has accumulated. This accumulation is likely to have influenced and reshaped users' perceptions, considerations, and decision-making regarding these substances, and these changes should also be considered in the planning of public health responses. Drug market data offer macro-level insights into contextual factors influencing drug use, such as legal frameworks, availability, and pricing, which are accessible in most European countries due to the high degree of standardisation in supply-side indicators. These data are essential for the development of supply-side interventions aimed at controlling drug use and its associated consequences. However, enhancing public health responses, including prevention, treatment, and harm reduction, requires a deeper understanding of the functions these substances serve in individuals' lives. Therefore, the present study focuses on the functional motivations underlying drug use.

The motives of cannabis use have been extensively studied, particularly the relationship between the individual motives and the frequency and problematic cannabis use (Bresin

& Mekawi, 2019; Gex et al., 2024). The major motives identified behind cannabis use are primarily coping motives (to avoid/escape adverse psychological states), furthermore enhancement motives (enhancing positive experiences), social motives, expansion motives (seeking expanded experiential awareness), conformity motives (due to peer pressure), and medical use motives (to manage chronic pain/conditions/anxiety, depression and to help with sleep) (Gex et al., 2024).

Kettner et al. (2019) were looking for motivational similarities of NPS with classical illicit drugs. When comparing the motives of new psychoactive substances with the motives of classical and legal psychoactive substances, they found that, unlike in the case of stimulant and hallucinogen NPS, which were similar to amphetamine and LSD, respectively, cannabinoid NPS were not similar to cannabis but showed a motivational profile closest to nicotine. With a further analysis of the proximity of motivational profiles, they identified four clusters. Synthetic cannabinoids were grouped alongside alcohol and nicotine due to their similar motivational patterns, while cannabis formed a distinct, standalone cluster (Kettner et al., 2019).

In our study, we aimed to answer the question of whether SCs are used as an alternative to cannabis to experience effects similar to those expected from cannabis. To answer this question, we investigated the functional motives of the use of cannabis and SCs reported by the respondents of the biggest European online survey conducted to date among people who use drugs, the 2021 wave of the European Web Survey on Drugs (EWSD).

Method

Design and Participants

The EWSD was conducted in the spring of 2021 simultaneously in 30 countries in 27 languages, out of which we included in the analysis all 21 participating EU member states and Switzerland. This cross-sectional study was carried out with convenient sampling, applying mostly online recruitment. The recruitment strategies within the countries slightly differed. However, it was primarily based on social media advertisements (79% of all respondents reported encountering the survey on social media) (EMCDDA, 2021b). Inclusion criteria for the participation were residing in the participating countries, a minimum age of 18, and the use of at least one of the following substances in the last year: cannabis, cocaine/crack, MDMA/ecstasy, amphetamine, methamphetamine, heroin, or new psychoactive substances. Participants had to actively give their consent to participate in the anonymous study. The study was coordinated by the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) and participating countries managed ethics approval for their own leg of the study. The web survey was open for respondents between March and April 2021 on the survey app LimeSurvey. The 2021 wave of EWSD received a total of 84,000 views with over 50,000 valid responses (EMCDDA, 2021b). In respect of the countries covered by this paper, a total of 48,427 valid responses were included in the analysis.

While online surveys are characterised by lower response rates when compared to traditional face-to-face or telephone interviews (Daikeler et al., 2020; Manfreda et al., 2008), Wu et al. (2022) found in their meta-analysis that online surveys with targeted recruitment positively impact the response rate. Differences in the regulation and restrictions of social media ads in the participating countries might have resulted in different reach, considering the topic of the survey. Further limitations are discussed in the "Discussion" section.

Questionnaire

The questionnaire applied was based on the previous two waves of EWSD (Matias et al., 2019; Škařupová et al., 2019) and further developed (Matias, 2022). The primary focus of the study was on the patterns of use for cannabis, cocaine, amphetamine, methamphetamine, MDMA/ecstasy, heroin, and NPS (investigated in detail in the seven drug modules); however in the introductory module, the past month/past year/lifetime use of alcohol, tobacco, benzodiazepine (without prescription), GHB/GBL, ketamine, LSD, magic mushroom, other hallucinogens, synthetic cathinones, and SCs were also recorded. In addition to potential biases related to social desirability and recall, self-reported data on drug use may also be compromised by users' lack of knowledge or misinformation about the substances they purchase or consume, an issue particularly relevant in the context of NPS.

The questionnaire included questions on the last time use of each substance listed above.

The motives of drug use were recorded in the case of the 7 substances with specific modules (cannabis, cocaine, amphetamine, methamphetamine, MDMA, heroin, and NPS). The study focused on the functional motives of drug use by applying an 8-item list of motives: (1) to reduce stress/relax. (2) to improve sleep, (3) to treat depression/anxiety, (4) to reduce pain/inflammations, (5) out of curiosity/to experiment, (6) to get high/for fun, (7) to socialise, (8) to enhance performance (school/work/sport/etc.), each of them as binary (yes/no) variables out of which respondents were allowed to endorse as many motives as they wished.

For more details about the variables used for this analysis and the selection methods, see the Supplement.

Selection of User Groups for Comparison

Based on last year cannabis and synthetic cannabinoid use (irrespective of other substances), we identified 4 user groups (see Table 1). Three of these groups were compared by motives for cannabis and SC use: (1) users of both cannabis and SCs (Hybrid), (2) SCs-only users (SCs only), and (3) cannabis-only users (CAN only), while the non-using group of "none" was excluded from further analysis.

In these 3 groups, "Hybrid" users and "CAN only" users reported cannabis use motives, and "Hybrid" users and "SCs only" users reported SC use-related motives. Due to the complexity of patterns of use, we carried out a total of 6 comparisons between "CAN only", "SCs only", and "Hybrid" users (see Table 2). Only those respondents were included in the analyses who provided a valid response to the questions of motives for drug use. Respondents with no reported motives for either cannabis or SCs were excluded from the analysis.

Statistics/Analysis

To define how different the population reached by the online survey from the general population of the given country, we looked at the latest last year prevalence (LYP) of use in the young adult (15–34) population estimated by general population surveys (based on EMCDDA, 2023b) in each country, by drug, and compared it with LYP measured by the online survey in respect of the EU member states included in the study. We divided the LYP of EWSD 2021 with the LYP of the general population studies in each country and

Table 1 Sample description by self-reported last year cannabis and synthetic cannabinoid use

	Used cannabis (CAN) last year		Did not use cannabis (CAN) last year		F/χ^2 (p)
	Used SCs last year "Hybrid"	Not used SCs last year "CAN only"	Used SCs last year "SCs only"	Not used SCs last year "None"	
N	253	44,723	80	3371	
Age mean (SD)	27.62 (8.47)	27.72 (8.23)	34.68 (9.18)	31.85 (9.10)	275.80 (<0.001)
Age—under 25 years old *N* (%)	123 (48.6)	20114 (45.1)	9 (11.3%)	788 (23.5)	864.87 (<0.001)
Gender—male *N* (%)	164 (68.0)	29977 (70.3)	54 (69.2)	2088 (64.5)	48.43 (<0.001)
Maximum level of education attained—maximum primary level of education *N* (%)	16 (7.4)	1651 (5.1)	24 (31.2)	207 (8.0)	284.68 (<0.001)

Table 2 The structure of comparison and sample size

	Compared motives	Compared groups	*N* (group1/group2)
(1)	CAN vs. CAN motives	CAN only vs. Hybrid users	33,467/220
(2)	SCs vs. SCs motives	SCs only vs. Hybrid users	80/253
(3)	CAN vs. SCs motives	CAN only vs. SCs only users	33,467/80
(4)	CAN vs. SCs motives	CAN only vs. Hybrid users	33,467/253
(5)	CAN vs. SCs motives	Hybrid vs. SCs only users	220/80
(6)	CAN vs. SCs motives	Hybrid vs. Hybrid users	193/193

calculated a mean value from it as a proxy indicator for the difference between the general population and the population captured by the online survey. (See data by country in the Supplement.)

The drug-specific comparisons of motives were carried out by two methods. In the case of the comparison of independent groups (in comparison 1, 2, 3, 4, and 5), we defined crude odds ratios by binary logistic regression with the endorsement of the motive as the dependent and the user group (based on last year's use of cannabis and SCs) as the independent variable. Since López-Pelayo et al. (2024) identified significant differences in cannabis and in SC use by age and gender, we calculated adjusted odds ratios by adding gender (as a binary variable) and age (as a continuous variable) to the above model as further independent variables. In each case, $\chi 2$ test was applied to test the significance of the effect of the independent variables. In the case of comparison (6), differences in the endorsement of the motives were calculated by nonparametric test, pairing cannabis use motives with the matching SC use motives. The significance of the results in this comparison was defined by McNemar test.

The analyses were conducted in IBM SPSS Statistics 25.

Results

The Sample

We included a total of 48,427 respondents in the analysis who were residing in one of the 21 EU countries participating in the study or Switzerland. The participating countries and the number of valid respondents by country are described in the Supplement.

Among the respondents included in the analysis, 67.0% (32,283 persons) reported to be male, 28.9% (13,914 persons) reported to be female, 2.2% (1067 persons) indicated "non-binary" or "other", and 1.9% (927 persons) preferred not to disclose their gender. The mean age of the sample was 28.02 years (SD 8.36). Further social demographic variables were included in the closing module of the questionnaire, resulting in lower response rates. Regarding the highest level of education attained, 15.0% reported having a maximum primary level of education (or did not complete secondary education), 53.0% reported having completed secondary education or attended but did not complete tertiary education, and 32.0% reported having completed tertiary education (university or equivalent). The majority, 57.5% of respondents, resided in a city, 26.9% lived in towns, and 15.7% lived in villages/countryside.

In respect of drug use (see Fig. 1), cannabis was the illicit drug used by most (93.1%) of the respondents in the last year (LY) followed by MDMA/ecstasy with 35.4%, cocaine 33.7%, and amphetamine 27.8%. 20.9% reported the use of magic mushrooms, 20.2% LSD, 17.7% benzodiazepines (without prescription), 13.1% ketamine, 10.7% other hallucinogens, 9.3% methamphetamine, 4.2% SCs, 4.1% synthetic cathinones, 3.2% heroin, and 3.0% GHB/GBL.

Since this web survey aimed to capture active drug users, the drug use prevalence estimates among respondents exceeded those in the general population. To understand better the differences between the respondents of the online survey and the general population, we compared the LY prevalence measured by the study with the LY prevalence measured in the young adult (15–34) population by general population surveys (EMCDDA, 2023b) in the participating EU countries (see data by country in the Supplement). We found that in average, 10.2 times higher last year cannabis use was reported by study respondent when compared to the GPS study results of the given country, 32.9 times higher last year use of

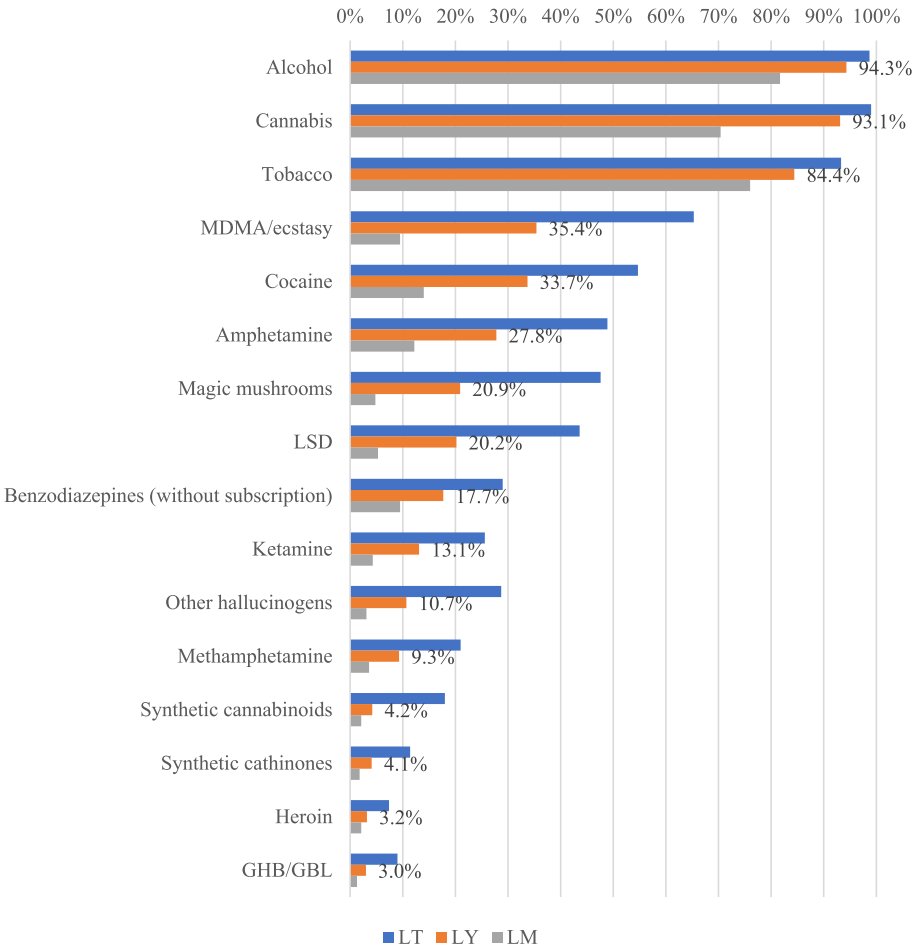


Fig. 1 Lifetime (LT), last year (LY), and last month (LM) use of psychoactive substances (%; $N = 48{,}427$ persons)

ecstasy/MDMA, 36.3 times higher last year use of amphetamine, and 36.1 times higher last year use of cocaine was reported.

Comparison of Motives of Cannabis Use and Motives of Synthetic Cannabinoid Use

As described in the "Method" section (Table 2), we carried out 6 comparisons between the identified 3 relevant user groups. First, we describe the results of each comparison then we summarise the outcomes of the different comparisons (depicted in Fig. 2).

Cannabis Use Motives Among Cannabis Only and Hybrid Users

In comparing the motives of cannabis use between "CAN only" and "Hybrid" users (see Table 3), we found significant difference in the likelihood of endorsing the motives of "to treat depression/anxiety" and "to socialise" both with and without controls for age and gender. No significant differences were observed in the endorsement of the other 6 motives.

Synthetic Cannabinoid Use Motives Among Synthetic Cannabinoids Only Users and Hybrid Users

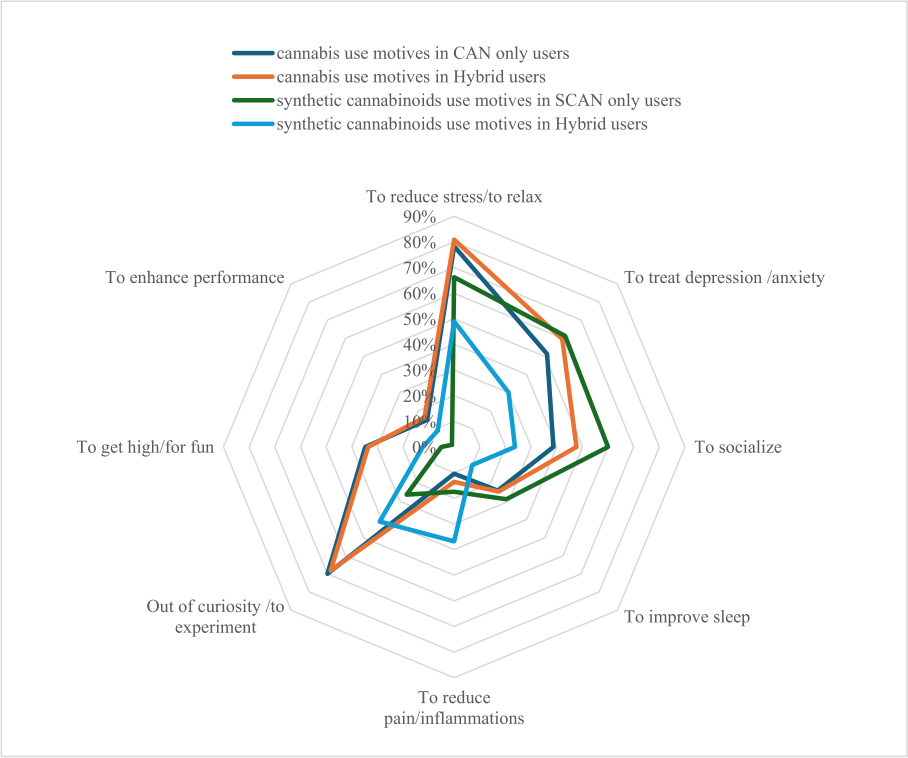
When comparing "SCs only" and "Hybrid" users regarding their motives for SC use (see Table 4), we found significant differences in the likelihood of endorsing motives such as "to treat depression/anxiety", "to socialise", and "to improve sleep", with the "SCs only" group showing a higher likelihood for these motives, while endorsing "to reduce pain/inflammations" less frequently. Significant differences also emerged for motives like "to reduce stress/relax", "out of curiosity/to experiment", and "to enhance performance" when age and gender were not controlled, with the "SCs only" group showing lower levels of curiosity and a lower tendency to use SCs for performance enhancement.

Synthetic Cannabinoid Use Motives and Cannabis Use Motives

Four comparisons between the motives of cannabis and SC use have been carried out. Three of these comparisons (comparison No. 3, No. 4, and No. 5—see Table 2) are carried out between different groups (different samples) that were created based on their last year cannabis and SC use. However, in the fourth comparison (comparison No. 6), motives of cannabis and SC use are compared in the same group (same sample) using both substances.

When comparing the motives of SC use in "SCs only" users with the motives of cannabis use in "CAN only" users (see Table 5), we found significant differences in the likelihood of endorsing motives such as "to reduce stress/relax", "out of curiosity/to experiment", "to get high/for fun", and "to enhance performance", with "CAN only" users more frequently endorsing these motives. Additionally, a significant difference was observed in the motive "to reduce pain/inflammations", with "SCs only" users more likely to endorse this motive.

When comparing the motives of cannabis use in "CAN only " users with the motives of synthetic cannabinoid use in "Hybrid " users (see Table 6), we found significant differences in the likelihood of endorsing all eight motives, both with and without controlling



	CAN motives in "CAN only" users	CAN motives in "Hybrid" users	SCAN motives in "SCs only" users	SCAN motives in "Hybrid" users
To reduce stress/to relax	78.3%	80.9%	66.3%	49.0%
To treat depression /anxiety	51.3%	59.5%	61.3%	30.0%
To socialize	38.7%	47.7%	60.0%	23.7%
To improve sleep	24.0%	24.5%	28.8%	9.9%
To reduce pain/inflammations	10.4%	13.6%	17.5%	36.8%
Out of curiosity /to experiment	70.0%	68.2%	26.3%	41.1%
To get high/for fun	34.7%	33.6%	5.0%	12.3%
To enhance performance	14.9%	16.4%	1.3%	9.1%

Fig. 2 Endorsement of motives of cannabis use and synthetic cannabinoid use by the past year use of synthetic cannabinoids and past year use of cannabis

for age and gender. For all motives, the "CAN only " group showed a higher likelihood of endorsement in respect of their cannabis use, except for the motive "to reduce pain/inflammations", which was more frequently endorsed by the "Hybrid " group as a motive of synthetic cannabinoid use.

When comparing the motives of cannabis use in "Hybrid" users with the motives of synthetic cannabinoid use in "SCs only" users (see Table 7), we found significant difference in the risk of endorsing the motive of "to reduce stress/relax", "out of curiosity/to experiment", "to get hight/for fun", and "to enhance performance" when the association

Table 3 Comparison (1) of cannabis use motives between "CAN only" and "Hybrid" users

Motive	"CAN only" users N=33467	"Hybrid" users N=220	Crude OR* (Ref.: "Hybrid" users)		Adj. OR** (Ref.: "Hybrid" users)	
	endorsing N (%)	endorsing N (%)	OR [95% CI]	*p*	OR [95% CI]	*p*
To reduce stress/relax	26219 (78.3)	178 (80.9)	0.85 [0.61-1.20]	0.357	0.80 [0.56-1.14]	0.219
To treat depression/anxiety	17163 (51.3)	131 (59.5)	0.72 [0.55-0.94]	0.015	0.68 [0.51-0.90]	0.007
To socialise	12936 (38.7)	105 (47.7)	0.69 [0.53-0.90]	0.006	0.67 [0.51-0.88]	0.004
To improve sleep	8022 (24.0)	54 (24.5)	0.97 [0.71-1.32]	0.842	0.93 [0.68-1.27]	0.630
To reduce pain/inflammations	3473 (10.4)	30 (13.6)	0.73 [0.50-1.08]	0.116	0.80 [0.53-1.22]	0.298
Out of curiosity/to experiment]	23416 (70.0)	150 (68.2)	1.09 [0.82-1.45]	0.565	1.07 [0.79-1.44]	0.655
To get high/for fun	11601 (34.7)	74 (33.6)	1.05 [0.79-1.39]	0.750	1.05 [0.78-1.40]	0.748
To enhance performance (school/work/sport/etc.)	4994 (14.9)	36 (16.4)	0.90 [0.63-1.28]	0.550	0.85 [0.59-1.22]	0.377

*Crude odds ratio calculated by binary logistic regression.

**Adjusted odds ratio calculated by a binary logistic regression model where age and gender were also added to the model as independent variables

Cells are shaded to indicate statistical significance: light grey for $p<0.050$, and dark grey for $p<0.001$

was not controlled by age and gender, and when controlled, a further motive, "to reduce pain/inflammations", showed significant difference.

Finally, we compared the different motives for using cannabis versus SCs within the same group, the "Hybrid" users (see Table 8). This comparison revealed a significant difference in the endorsement of each of the eight motives between cannabis and synthetic cannabinoid use. All motives were more frequently endorsed for cannabis use, except for the motive "to reduce pain/inflammations", which was higher for synthetic cannabinoid use.

In summary, we identified significant differences in the motives of cannabis use and the motives of SC use particularly for the motives "to reduce stress/ anxiety", "to reduce pain/ inflammations", "out of curiosity/to experiment", "to get high/for fun", and the "to enhance performance", in all 4 comparisons (considering associations controlled by age and gender when comparing unrelated samples). In the case of the motive "to socialise", we identified significant difference in 3 out of the 4 comparisons, and in the case of the motives "to treat depression and "to improve sleep", we identified significant difference in 2 out of the 4 comparisons (considering the association controlled by age and gender when comparing unrelated samples).

As shown also in Fig. 2, endorsing the motives "to reduce stress/relax", "out of curiosity/to experiment", "to get high/for fun", and "to enhance performance" proved to be more the characteristic of cannabis use. Endorsing the motive "to reduce pain/inflammations"

Table 4 Comparison (2) of synthetic cannabinoid use motives between "SCs only" and "Hybrid" users

Motive	"SCs only" users N=80	"Hybrid" users N=253	Crude OR* (Ref.: "Hybrid" users)		Adj. OR** (Ref.: "Hybrid" users)	
	endorsing N (%)	endorsing N (%)	OR [95% CI]	*p*	OR [95% CI]	*p*
To reduce stress/relax	53 (66.3)	124 (49.0)	2.04 [1.21-3.45]	0.008	1.72 [0.98-3.02]	0.059
To treat depression/anxiety	49 (61.3)	76 (30.0)	3.68 [2.18-6.22]	<0.001	3.06 [1.74-5.37]	<0.001
To socialise	48 (60.0)	60 (23.7)	4.82 [2.83-8.22]	<0.001	4.93 [2.75-8.83]	<0.001
To improve sleep	23 (28.8)	25 (9.9)	3.68 [1.95-6.95]	<0.001	3.01 [1.50-6.04]	0.002
To reduce pain/inflammations	14 (17.5)	93 (36.8)	0.36 [0.19-0.69]	0.002	0.50 [0.26-0.97]	0.041
Out of curiosity/to experiment]	21 (26.3)	104 (41.1)	0.51 [0.29-0.89]	0.018	0.70 [0.38-1.29]	0.258
To get high/for fun	4 (5.0)	31 (12.3)	0.38 [0.13-1.10]	0.075	0.43 [0.12-1.53]	0.192
To enhance performance (school/work/sport/etc.)	1 (1.3)	23 (9.1)	0.13 [0.02-0.95]	0.045	0.15 [0.02-1.22]	0.076

*Crude odds ratio calculated by binary logistic regression.

**Adjusted odds ratio calculated by a binary logistic regression model where age and gender were also added to the model as independent variables

Cells are shaded to indicate statistical significance: light grey for p<0.050, and dark grey for p<0.001

was more the characteristic of SC use than that of cannabis use. Endorsing the motives "to treat depression/anxiety", "to socialise", and "to improve sleep" showed a mixed picture.

Discussion

Based on the responses of over 34,000 recent cannabis/SC users reached by the 2021 wave of the European Web Survey on Drugs in 21 European countries and Switzerland, an interestingly complex pattern of motivational differences and similarities could be identified between the motives for cannabis and the motives for SC use.

The results of the study show a clear difference between the motives behind cannabis and SC use, which is in line with Kettner et al. (2019), who found a distinct motivational pattern when comparing SCs and cannabis use motives. In the case of five out of the examined eight motives, all comparisons showed a significant difference in the motives of cannabis and SC use, while in the case of three motives, partial differences could be identified (out of the 32 motivational comparisons, 26 showed a significant difference).

Reducing stress (a classical coping motive), getting high, and enhancing performance and curiosity, which are the typical recreational motives of drug use, proved to be more pronounced in the case of cannabis use than in the case of the use of SCs.

Table 5 Comparison (3) of synthetic cannabinoid use motives with cannabis use motives between "SCs only" and "CAN only" users

Motive	"SCs only" users N=80	"CAN only" users N=44723	Crude OR* (Ref.: "CAN only" users)		Adj. OR** (Ref.: "CAN only" users)	
	endorsing N(%)	endorsing N(%)	OR [95% CI]	*p*	OR [95% CI]	*p*
To reduce stress/relax	53(66.3)	26219(78.3)	0.54 [0.34-0.86]	0.010	0.54 [0.34-0.86]	0.010
To treat depression/anxiety	49(61.3)	17163(51.3)	1.50 [0.96-2.36]	0.077	1.61 [1.02-2.54]	0.042
To socialise	48(60.0)	12936(38.7)	2.38 [1.52-3.73]	<0.001	2.82 [1.78-4.46]	<0.001
To improve sleep	23(28.8)	8022(24.0)	1.28 [0.79-2.08]	0.318	1.12 [0.68-1.84]	0.661
To reduce pain/inflammations	14(17.5)	3473(10.4)	1.83 [1.03-3.27]	0.040	2.93 [1.62-5.30]	<0.001
Out of curiosity/to experiment]	21(26.3)	23416(70.0)	0.15 [0.09-0.25]	<0.001	0.18 [0.11-0.30]	<0.001
To get high/for fun	4(5.0)	11601(34.7)	0.10 [0.04-0.27]	<0.001	0.09 [0.03-0.29]	<0.001
To enhance performance (school/work/sport/etc.)	1(1.3)	4994(14.9)	0.07 [0.01-0.52]	0.009	0.09 [0.01-0.63]	0.015

*Crude odds ratio calculated by binary logistic regression.

**Adjusted odds ratio calculated by a binary logistic regression model where age and gender were also added to the model as independent variables

Cells are shaded to indicate statistical significance: light grey for p<0.050, and dark grey for p<0.001

Coping motives are a defining drive behind cannabis use (Gex et al., 2024), especially in people affected by depression, anxiety (Gex et al., 2024), or negative consequences of drug use (Fox et al., 2011). Based on our results, it seems that SCs are not replacing cannabis as aids in coping with different life situations. When comparing the effect profile of cannabis and SCs, Winstock and Barratt (2013) found that cannabis use was associated with greater pleasurable effects when high than SCs and respondents reported being more able to function after its use, that explains the higher endorsement of getting high and enhancing performance in the case of cannabis in our study. In another study, comparing the motives of different NPSs, Benschop et al. (2020) also found that SCs were associated with the weaker endorsement of enhancement and social motives (when compared with motives of other NPSs). On the other hand, while curiosity seemed to be one of the major motives behind SC use in the early 2010s (Barratt et al., 2013; Loeffler et al., 2016), it seems to be a less defining motive now, 10 years later, based on our results.

Cannabis has a widespread therapeutic use for pain management, both as a prescription drug and as a way of self-medication. In the 1970s, SCs were explored for their potential in treating cancer pain (Lafaye et al., 2017). Therefore, it is no surprise that the management of pain appears in both the motivational pattern of cannabis and SCs. An Australian study

Table 6 Comparison (4) of cannabis use motives with synthetic cannabinoid use motives between "CAN only" and "Hybrid" users

Motive	"CAN only" users N=33467	"Hybrid" users N=253	Crude OR* (Ref.: "Hybrid" users)		Adj. OR** (Ref.: "Hybrid" users)	
	endorsing N(%)	endorsing N(%)	OR [95% CI]	*p*	OR [95% CI]	*p*
To reduce stress/relax	26219(78.3)	124(49.0)	3.76 [2.94-4.82]	<0.001	3.80 [2.95-4.90]	<0.001
To treat depression/anxiety	17163(51.3)	76(30.0)	2.45 [1.87-3.21]	<0.001	2.51 [1.90-3.31]	<0.001
To socialise	12936(38.7)	60(23.7)	2.03 [1.52-2.71]	<0.001	2.02 [1.50-2.72]	<0.001
To improve sleep	8022(24.0)	25(9.9)	2.88 [1.90-4.35]	<0.001	2.79 [1.83-4.26]	<0.001
To reduce pain/inflammations	3473(10.4)	93(36.8)	0.20 [0.15-0.26]	<0.001	0.19 [0.15-0.25]	<0.001
Out of curiosity/to experiment]	23416(70.0)	104(41.1)	0.15 [0.09-0.25]	<0.001	3.60 [2.77-4.68]	<0.001
To get high/for fun	11601(34.7)	31(12.3)	3.34 [2.60-4.29]	<0.001	4.15 [2.79-6.16]	<0.001
To enhance performance (school/work/sport/etc.)	4994(14.9)	23(9.1)	3.80 [2.61-5.54]	<0.001	1.90 [1.20-3.02]	0.006

*Crude odds ratio calculated by binary logistic regression.

**Adjusted odds ratio calculated by a binary logistic regression model where age and gender were also added to the model as independent variables

Cells are shaded to indicate statistical significance: light grey for p<0.050, and dark grey for p<0.001

found that 9% of users had a therapeutic motive for using SCs for the first time (Barratt et al., 2013). In our comparison, we found that the motivation of reducing pain/inflammations is more pronounced in the case of SC use, meaning that it is more typical to use these substances with a self-medicating purpose than using cannabis.

However, the results also revealed differences not only between the motives of cannabis and SC use but also in the motives of the different user groups (in using the same substance). In the case of cannabis use, the higher likelihood of endorsing motives related to managing anxiety and depression among the "Hybrid" group when compared to cannabis-only users may reflect a higher prevalence of mental health challenges or stronger emotional needs within this group, potentially using both substances (cannabis and SCs) as a coping mechanism with a self-medicating purpose.

In the case of SCs, the "SCs only" group more frequently endorses motives related to treating depression/anxiety, supporting social interactions, and improving sleep, suggesting that these users may primarily use SCs to address psychological and social needs. These motives may play a key role in enhancing their quality of life or alleviating specific issues. In contrast, "Hybrid" users exhibit higher levels of curiosity and increased tendency toward

Table 7 Comparison (5) of cannabis use motives with synthetic cannabinoid use motives between "Hybrid" and "SCs only" users

Motive	"Hybrid" users N=220	"SCs only" users N=80	Crude OR* (Ref.: "SCs only" users)		Adj. OR** (Ref.: "SCs only" users)	
	endorsing N(%)	endorsing N(%)	OR [95% CI]	*p*	OR [95% CI]	*p*
To reduce stress/relax	178(80.9)	53(66.3)	0.46 [0.26-0.82]	0.008	0.40 [0.21-0.75]	0.004
To treat depression/anxiety	131(59.5)	49(61.3)	1.07 [0.64-1.81]	0.790	0.83 [0.47-1.47]	0.515
To socialise	105(47.7)	48(60.0)	1.64 [0.98-2.76]	0.061	1.73 [0.98-3.04]	0.059
To improve sleep	54(24.5)	23(28.8)	1.24 [0.70-2.20]	0.461	1.05 [0.56-1.96]	0.874
To reduce pain/inflammations	30(13.6)	14(17.5)	1.34 [0.67-2.69]	0.404	2.88 [1.27-6.56]	0.012
Out of curiosity/to experiment]	150(68.2)	21(26.3)	0.17 [0.09-0.30]	<0.001	0.22 [0.12-0.40]	<0.001
To get high/for fun	74(33.6)	4(5.0)	0.10 [0.04-0.30]	<0.001	0.11 [0.03-0.38]	<0.001
To enhance performance (school/work/sport/etc.)	36(16.4)	1(1.3)	0.06 [0.01-0.48]	0.007	0.08 [0.01-0.60]	0.014

*Crude odds ratio calculated by binary logistic regression.

**Adjusted odds ratio calculated by a binary logistic regression model where age and gender were also added to the model as independent variables

Cells are shaded to indicate statistical significance: light grey for p<0.050, and dark grey for p<0.001

experimental use which may display a stronger motivation for novel experiences, reflecting an openness to exploring different substances/effects. At the same time, "Hybrid" users reported to use SCs for pain relief and performance enhancement more often, suggesting that this group has a broader range of goals or more specific purposes in their use of SCs.

This study has some limitations that should be considered when interpreting the findings. Convenience sampling and online recruitment might introduce self-selection bias, as participation was voluntary and may have attracted individuals more engaged with drug-related online content. Some people are more willing to take part in online surveys, while others have the tendency to ignore them, leading to systematic bias (Wright, 2005). The recruitment campaign of the study was not standardised among participating countries, and social media ad restrictions apply differently in different legal frameworks that might have affected the effectiveness of the recruitment, resulting in different engagement. The above limitations of online survey methods limit the generalisability of results. At the same time, the study applied a randomisation in the appearance of the different drug modules, which aimed to reduce the question order bias. Recall bias may also be present, as participants self-reported their substance use and motives, potentially leading to inaccuracies in their responses. Furthermore, despite the anonymity of the survey, social desirability bias could have influenced responses, especially regarding stigmatised motives for drug use. To address the above issues, this study was preceded by two pilot studies and the cognitive testing of the questionnaire in many countries (Matias et al., 2019; Škařupová et al.,

Table 8 Comparison (6) of synthetic cannabinoid use motives with cannabis use motives in "Hybrid" users

Motive	"Hybrid" users N=193		Added motives of synthetic cannabinoids*	Added motive of cannabis**	Similarity in the presence of motive***	Similarity in the absence of motive****	McNemar test p
	endorsing the motive behind cannabis use N(%)	endorsing the motive behind synthetic cannabinoid use N(%)	N (%)	N (%)	N (%)	N (%)	
To reduce stress/relax	154(79.79)	107(55.44)	13(6.74)	60(31.09)	94(48.70)	26(13.47)	<0.001
To treat depression/anxiety	115(59.59)	70(36.27)	13(6.74)	58(30.1)	57(29.53)	65(33.68)	<0.001
To socialise	92(47.67)	48(24.87)	11(5.70)	55(28.50)	37(19.17)	90(46.63)	<0.001
To improve sleep	47(24.35)	22(11.40)	7(3.63)	32(16.58)	15(7.77)	139(72.02)	<0.001
To reduce pain/inflammations	27(13.99)	81(41.97)	60(31.09)	6(3.11)	21(10.88)	106(54.92)	<0.001
Out of curiosity/to experiment]	125(64.77)	87(45.08)	13(6.74)	51(26.42)	74(38.34)	55(28.50)	<0.001
To get high/for fun	61(31.61)	27(13.99)	5(2.59)	39(20.21)	22(11.40)	127(65.80)	<0.001
To enhance performance (school/work/sport/etc.)	32(16.58)	20(10.36)	9(4.66)	21(10.88)	11(5.70)	152(78.76)	0.045

The comparison was carried out by nonparametric test.

*Frequency when the specific motive was not indicated for cannabis use.

**Frequency when the specific motive was not indicated for synthetic cannabinoid use.

***Motives that are indicated for both cannabis and synthetic cannabinoid use.

****: Motives that are selected that are not indicated for either condition

Cells are shaded to indicate statistical significance: light grey for $p<0.050$, and dark grey for $p<0.001$

2019) that aimed, among other issues, to improve questions that require people to recall past behaviours and to apply more inclusive language. Lastly, the survey mode itself may have excluded individuals with limited internet access or lower digital literacy, potentially skewing the sample toward younger and more digitally connected users. To reflect this limitation, we presented above the differences in the drug use prevalence measured by general population surveys and the 2021 wave of EWSD.

Since the motives were measured using binary variables, the analysis could not assess the relative strength of different motivations, which should be considered when interpreting the results.

Despite these limitations, the study provides valuable insights into the distinct functional motives underlying cannabis and synthetic cannabinoid use.

Conclusions

Web surveys offer unique access to active drug users and an opportunity to better understand their usage patterns and motivations. This cross-country survey conducted in 27 different languages managed to involve respondents from most European countries, providing

detailed information on their substance use and purchasing practices, which, even bearing in mind its limitations, is an invaluable source of information on topics mostly studied based on smaller-scale local surveys.

Following the emergence of NPS, users' motivations were rather driven by their novelty and therefore, many studies identified curiosity as a major functional motive of NPS use (Barratt et al., 2013; Loeffler et al., 2016). However, throughout the years, their novelty faded, and information accumulated on their effects, dosing, and negative consequences (EMCDDA, 2021a; EMCDDA, 2023c). We can assume that this experience shaped the narrative about these substances and, therefore, the way users think about them. In our study, we learned that curiosity is not the major motive behind the use of SCs, but other functional motives are more pronounced. We also learned that the motives for SC use are different from the motives of cannabis use, suggesting that people do not use SCs as a replacement for cannabis anymore, as was also confirmed by Kettner et al. (2019). Among others, we found that some self-medicating motives behind SC use are more pronounced than in the case of cannabis use, which highlights the unmet need for psychosocial interventions in SC users. SC use is a characteristic of some marginalised communities in Europe (EMCDDA, 2021a; Wieczorek et al., 2022) mostly due to its low price that are reported to be, in some cases, cheaper than alcohol (Csák et al., 2020). These communities are especially hard to reach and have generally lower access to health and social responses, which highlights the need to better address mental health problems in as many ways as possible to prevent SCs use and its consequences among these vulnerable populations.

The functional motivational differences and similarities between new and classical psychoactive substances remain insufficiently explored. Our findings contribute to a better understanding of the needs that new psychoactive substances and synthetic cannabinoids may fulfil. However, further investigation of motivational patterns is necessary in both non-clinical and clinical populations, particularly in relation to high-risk patterns of drug use, including polysubstance use, and dependence.

Our review of the scientific literature revealed a critical oversight in how new psychoactive substances (NPS) are studied and addressed: they are frequently treated as a single, homogeneous category, despite substantial variability in their pharmacological properties, availability, user demographics, and patterns of use. To better understand and effectively respond to the NPS phenomenon, future research must adopt a more nuanced and segmented approach that captures this diversity.

Online studies on drug use motives, including the EWSD, should prioritise the use of scale-type motivational measures instead of binary variables. This approach would better capture users' prioritisation of motives. Additionally, improving standardisation in recruitment strategies could enhance the comparability and replicability of such studies.

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Péterfi and Róbert Urbán performed the data cleaning, database preparations, and analysis. The manuscript was written and developed by Anna Péterfi, Róbert Urbán, João Matias, and Zsolt Demetrovics. All authors read and approved the final manuscript.

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Data Availability Raw data of the 2021 wave of the European Web Survey on Drugs is not publicly available, however, data requests can be made to the European Union Drugs Agency.

Declarations

Ethics Approval The Hungarian leg of EWSD 2021 received ethics approval from the IRB of the Faculty of Education and Psychology, ELTE Eötvös Loránd University.

Consent to Participate Informed consent was obtained from all respondents. They had to provide their consent by clicking a checkbox before starting the survey. The survey was anonymous; no personal identifications were recorded or stored (not even IP addresses).

Conflict of interest The authors declare no competing interests.

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