Different Phases of ATS Use Call for Different Interventions: a Large Qualitative Study in Europe

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Research

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Abstract

Background: Amphetamine Type Stimulants (ATS) are globally widely used. However, there is limited understanding of what influences different phases of ATS use, as well as whether this varies by type of ATS user (groups). The ATTUNE study investigated which factors shape individual ATS use patterns. In this article, we report on these phases into and out of ATS use, and propose a set of recommendations for prevention, harm reduction and treatment of the different phases of ATS use.

Methods: Qualitative, semi-structured interviews (n= 237) were conducted in five different European countries with participants who had used ATS, varying from a few times in a lifetime to daily.

Results: Most ATS users consumed amphetamine only (28%), followed by amphetamine and MDMA (17%). Yet, types of ATS used differed between the countries. We found that that ATS users have various motives for and dynamic patterns of ATS use with alternating phases of increase, continuation and decrease. Cessation was pursued in different ways and for diverse reasons, such as mental health problems and maturing out. Availability seemed not an issue, regardless of the type of user, phase or country.

Conclusions: These findings demonstrate that tailor-made interventions are needed for the diverse user types and different phases or patterns of ATS use, to reduce possible harms of use. We recommended a set of interventions for the different ATS phases. These include drug checking services, peer-led information, self-management of ATS use, mental health support to help people cope with stressful life events and prevent uncontrolled use, and follow-up support after treatment.

Introduction

Amphetamine Type Stimulants (ATS) (amphetamine, MDMA, methamphetamine, illicit use of prescription drugs, e.g. methylphenidate and Ritalin, and new psychoactive substances that mimic the effects of stimulants) are the second most commonly used illicit drugs worldwide and the third in Europe and create the largest challenge in the synthetic drug area (EMCDDA, 2020; United Nations, 2020). Across the European Union, 1.2% of individuals aged 15–34 reported using amphetamines (amphetamine and/or methamphetamine) in the past 12 months, and 1.9% MDMA. However, ATS use rates vary by country: the highest last-year prevalence for amphetamine among young adults aged 15–34 years is found in Germany (2.9%) and for MDMA in the Netherlands (6.9%) (EMCDDA, 2020). Amphetamine is rather prevalent in countries like Germany, Poland, Hungary or Norway, Sweden and Finland, and methamphetamine is mostly reported in Czechia, Slovakia and some Baltic states. MDMA use is found most popular in The Netherlands, Ireland, United Kingdom, Bulgaria (EMCDDA, 2020).

Some qualitative and few quantitative studies exploring influences on ATS use have been conducted, primarily focusing on initiation of ATS use. A systematic review identified individual, social and environmental influences shaping key phases in ATS use: initiation, continuation, increase/relapse and decrease/abstinence (O'Donnell et al., 2019). Significant motives for the initiation of ATS use include

curiosity (Duff & Moore, 2015; Levy et al., 2005; Van Hout & Brennan, 2011); to boost work/studies performance (Boeri et al., 2006, 2009; Ho et al., 2013), endurance at dance events (Ding et al., 2013; Eiserman et al., 2005; Ho et al., 2013) and self-management of stress or mental health issues (Boeri et al., 2009; Cheney et al., 2018; Fast et al., 2009; Levy et al., 2005; Smirnov et al., 2013). Stress and psychological distress have been found a complex factor for both initiation of ATS use, and continuation and increase of use, in particular among methamphetamine users (Herman-Stahl et al., 2007). Some evidence suggests that continued and/or increased ATS use occurs to support specific functional needs (improvement of stress management or decreased insecurity in social situations) and to help cope with withdrawal effects (Bavarian et al., 2013; Carbone-Lopez et al., 2012; Duff & Moore, 2015; Eiserman et al., 2005; Fast et al., 2009; Kerley et al., 2014; Sterk et al., 2007). The experience of life events (new/ended relationships, death of a close family member, etc.) also appears to be associated with persistent use (Boeri et al., 2009; Ho et al., 2013; Kerley et al., 2014). Factors that have been linked to a decrease in use include an increased perception of negative health impacts (Bungay et al., 2006; Eiserman et al., 2005; Fast et al., 2009; Levy et al., 2005), changing social networks, and limited availability of ATS (Bourne et al., 2015; O'Brien et al., 2008; Sexton et al., 2008). O'Donnell et al (2019) found that family, peers and social networks played a crucial role throughout all turning points: on the one hand, they facilitated access to ATS, and on the other hand, they supported normalization of ATS use over time (O'Donnell et al., 2019). Their review also showed that experiencing mental health problems, a relationship break-up and social and economic exclusion were returning themes involved in most phases of ATS consumption. Nonetheless, they showed that in general there is a lacuna in the current literature about what factors contribute to phases such as an increase and decrease in ATS use (O'Donnell et al., 2019). Long term ATS use could lead to physical (Hearne et al., 2016; Hunter et al., 2012), mental (Zweben et al., 2010) and social harms (e.g. Grund et al., 2010) including (psychological) dependence (e.g. Degenhardt et al., 2014; Fisher & Stanciu, 2017). However, there is limited understanding of what influences different phases of ATS use. Additionally, without thorough knowledge on what influences ATS use phases and its turning points, truly knowing what can prevent (further) harms in the different phases of ATS use, remains a blind spot as well.

Most interventions directed to prevent, treat or reduce the harms of illegal drug use currently focus on (injected) opioids (Farrell et al., 2019; Harm Reduction International, 2020). Yet, people who use ATS usually do not identify themselves with (problematic) opioid use, often belong to different networks of users, and do not perceive opioid focused services as relevant to them (WHO, 2011). They might develop different phases of drug use, face different drug-related harms, and have different needs than those using opioids, requiring thus specific or adapted services (Rigoni et al., 2019). Developing tailor-made and effective interventions for ATS users is necessary and requires a close analysis of the different groups, their specific needs and the relations that people establish with the different substances.

To fill these knowledge gaps on influencing factors on ATS use phases and subsequently on effective interventions, this paper builds upon the findings of a large multinational research (ATTUNE) on ATS phases. Based on ATTUNE's qualitative data of ATS phases as described by users in five European

countries – Netherlands, UK, Germany, Poland and Czechia - our paper proposes a set of recommendations for prevention, harm reduction and treatment of the different phases of ATS use.

Methods & Data

Study design

ATTUNE was a multinational study that investigated which factors shape individual ATS use phases (see Rosenkranz et al., 2019). The study was conducted in the Netherlands, UK, Germany, Poland and Czechia. A sequential, exploratory design was used, combing quantitative and qualitative methods. For purposes of this paper, we focus on the qualitative data only, namely the in-depth interviews conducted with different types of ATS users. Exposed non-users were also included in the study but left out for this paper, since we focused on actual use and interventions. Qualitative research allows exploring ATS users' beliefs, perspectives and experiences that influence trajectories of substance use, also improving our understanding of the processes and social context involved in changes (Liebregts et al., 2013; Nichter et al., 2004). For prevention, harm reduction and treatment programs such in-depth insights are deemed essential (Nichter et al., 2004; O'Donnell et al., 2019).

user groups and recruitment

To reach a sufficient variety of ATS use patterns, we defined groups of ATS users according to their currency and frequency of ATS use. Exposure to ATS use was operationalized as having opportunities to take ATS due to being present when peers, partners, and/or family members were using ATS. The qualitative interviews targeted five different groups, each with equal size and gender distribution: currently dependent users (CDU), formerly dependent users (FDU), nondependent current frequent users (CNU), formerly frequent users (FNU), and non-frequent users (NNU). Current use referred to ATS use in the past 12 months. Frequent use was defined as > 10 consumption days in 12 months. Dependence on ATS was assessed using the severity of dependence scale (SDS) (Gossop et al., 1995) with the recommended cut-off for ATS of ≥ 4 points (Bruno et al., 2009).

Individuals who had ATS were regarded as eligible for inclusion in the ATTUNE study. Participant's first ATS use had to take place at least five years before the interview to ensure inclusion of only those who had had the opportunity to experience changes in their ATS use career. To avoid overlap between trajectories into opioid use and trajectories into ATS use, people previously diagnosed with opioid dependence (self-reported) were excluded[1]. This also prevented domination of the sample by opioid users who primarily use(d) stimulants to complement their opioid use. Other inclusion criteria were: aged ≥ 18 years; being a resident in one of the five national sampling regions; and verbal and cognitive ability to take part in the interview.

Multiple purposive sampling strategies were used to recruit participants into the study, including snowball sampling; announcements on social media and internet forums; leaflets and posters distributed at universities, student portals, nightlife settings and third sector organizations; via gatekeepers and

professionals at substance use services and treatment facilities; and via the researchers' social networks. The sampling criteria were monitored for the different groups, as well as diversity regarding age, gender and treatment experiences. Not in all countries, participants were evenly distributed over the five groups, as some profiles were harder to find than others.

Data collection and analysis

Interviews were conducted face-to-face between February and August 2017. Each interview lasted on average one hour. They took place at different (quiet) locations, mostly at the university, research institute, at participant's house or in public spaces such as a cafe. After completion of the interview, each participant received an incentive (money or vouchers, depending on the country).

A guideline was used to structure the interviews. It included questions about participants' ATS use career (i.e., changes in use trajectories and occurrence of life events in various domains). Interviewees were asked to recall changes in different life domains and their ATS use patterns in their entire life, using individual time charts (Liebregts, 2018; Martens et al., 2020). The time chart referred to the frequency of substances used and to experiences in life domains (including social life, health, work/study, leisure). All interviews were digitally recorded (with participant's consent), fully transcribed and entered into NVivo or MaxQDA. The analysis of the interviews was structured around the four use phases (initiation, continuation, increase and decrease) which were based on the literature (O'Donnell et al., 2019). For each of the phases the individual, social and environmental circumstances were explored. Each country analyzed their own data through a similar detailed coding scheme and wrote a report with the findings, which were then combined and compared for all countries on main patterns and differences. To guarantee anonymity, interviewees were identified with an alias (name or number).

Participants

In total 237 (ex-) users were interviewed in the five countries, (unevenly) distributed over the target groups (see Table 1). In total 41% were female. In the Netherlands, an equal gender distribution was realized as intended, while in Germany, Poland and the Czechia more males than females were interviewed. In the UK, more females participated in the interviews. Participants were on average between 30 (Germany) and almost 33 (The Netherlands) years old. There were notable differences between the five groups and the countries. Overall, participants from group 3 (frequent users) were the youngest with a mean age of ca. 29 years, while the respondents from group 2 (formerly dependent users) were the oldest ones with a mean age of over 33 years.

Overall, ATS use was initiated at age 17 to 19 years (Table 1). However, especially group 1 (CDU) and group 4 (FFU) showed an earlier onset compared to the other three user groups. Age of onset of ATS use also differed noticeably between the groups and countries. In Germany and the Netherlands members of group 1 were slightly older than 16 years at onset. In UK and Poland group, 4 initiated their ATS use early at approximately 16 years old. More than one-third of the total sample scored positive on the Severity of Dependence Scale, indicating ATS dependence. Across the countries, the proportion of respondents with

ATS dependence varied from 21% in Poland to 48% in Germany. The vast majority of ATS dependent interviewees were from group 1 and 2 (as targeted).

Table 1
Age, age of ATS onset and ATS dependence of participants by country

Country	Mean	Group 1 CDU	Group 2 FDU	Group 3 CFU	Group 4 FFU	Group 5 NFU	Total
Germany	- total n	9	17	12	6	9	53
	- Female n	5	8	3	2	3	21
	- age	28.2	30.2	27.2	34.7	33.8	30.8
	- age of ATS onset	16.3	17.6	18.3	21.2	21.8	18.7
	-SDS positive %	100	88.2	16.7	0	0	48.3
United Kingdom	- total n	12	14	9	11	11	57
	- Female n	7	6	4	8	5	30
	- age	37.2	35.4	32.6	30.5	28.1	32.8
	- age of ATS onset	18.0	16.2	18.2	15.8	17.2	17.0
	- SDS positive %	100	85.7	11.1	18.2	18.2	42.6
Poland	- total n	10	10	12	5	15	52
	- Female n	3	5	1	2	4	15
	- age	30.1	32.7	25.3	33.2	33.3	30.9
	- age of ATS onset	18.1	17.3	17.7	16.4	18.1	17.7
	SDS positive %	60.0	70.0	0	0	0	21.3
Netherlands	- total n	10	10	10	10	10	50
	- Female n	5	4	4	4	6	23
	- age	34.9	35.2	31.0	35.9	28.9	33.2
	- age of ATS onset	16.4	17.6	19.3	17.3	19.8	18.1
	SDS positive %	80.0	100	0	0	0	30.0

Country	Mean	Group 1 CDU	Group 2 FDU	Group 3 CFU	Group 4 FFU	Group 5 NFU	Total
Czechia	- total n	6	5	5	5	4	25
	- Female n	2	2	0	1	2	7
	- age	26.8	38.2	34.6	27.4	29.5	31.3
	- age of ATS onset	17.5	26.8	23.0	17.8	19.5	20.8
	SDS positive %	83.3	100	0	0	0	33.3
Total	**- total n**	**47**	**56**	**48**	**37**	**49**	**237**
	- Female n	**22**	**25**	**12**	**17**	**20**	**96**
	- age	**32.1**	**33.6**	**29.3**	**32.6**	**31.0**	**31.7**
	- age of ATS onset	**17.3**	**18.0**	**18.8**	**17.4**	**19.0**	**18.2**
	- SDS positive %	**85.1**	**85.7**	**6.3**	**16.2**	**4.1**	**35.5**

Types of ATS used differed between the countries. While in the Czechia methamphetamine was the dominant drug used, in Germany use of this substance only occurred in the border region to Czechia. In all other countries, methamphetamine was rarely used. Of the total sample, most ATS users consumed amphetamine only (28%), followed by amphetamine and MDMA (17%). In the Czech Republic, methamphetamine was most prevalent (used by 60% of participants). In Germany amphetamine was mostly used in group 1 (CDU, 44.4%) and amphetamine and MDMA most widespread in group 3 (CFU) and group 5 (NFU) (58.3%; 55.6%). In the Netherlands, the majority of group 1 and group 2 were amphetamine users (90%; 70%), and MDMA prevailed in the other groups. Similarly, in the UK most of the respondents from group 1 and group 2 consumed amphetamine (58.3%; 50.0%), but also those in group 5 (45.5%). Furthermore, the majority of group 3 were MDMA users. In Poland amphetamine was mostly consumed in group 4 (FFU) and group 5 (NFU) (50%; 60%). The second most widespread was the use of amphetamine and NPS which occurred in particular in group 1 (30%) (not in table).

Daily ATS use (lifetime) showed predominately ATS dependent individuals (group 1 and 2). Especially in Czechia, the Netherlands and the UK, between 70% and 100% of the group 1 and group 2 members had ever used ATS daily. In all countries, mainly ATS dependent participants had been in contact with drug counselling services or addiction treatment at least once, ranging from drug counselling, detoxification, to residential drug treatment.

[1]Not for UK

Results

ATS use phases

Initiation

Participants motivated their first ATS use predominately by either hedonism or coping with difficult personal situations, and/or mental health problems. Hedonism implied curiosity, pleasure-seeking and the desire to stay awake on party weekends. Coping was related to suppressing or managing experiences of depression, low self-esteem or social phobia. Few interviewees initiated ATS use for functional reasons to enhance work or studies performance or to increase sexual pleasure. Especially students used methylphenidate (e.g., Ritalin) for a limited period of time to enhance performance in their studies. Furthermore, several participants linked their first ATS use to peer influences. ATS using peers were important to ensure availability at initiation, but also to inform about dosage and effects of the substance. While several respondents described the availability of the preferred ATS substance as a challenge, in the beginning, costs were not an issue in the phase of initiation.

At initiation most participants mentioned the positive effects of the substances such as feeling alert, energetic and without hunger (amphetamine), feeling socially connected, talkative and happy (MDMA). The effects of methamphetamine were experienced as ambiguous due to an extraordinary feeling of wellbeing on the one hand, and the loss of concentration as well as feelings of paranoia on the other hand. Methamphetamine users tended to increase their frequency of use rapidly (compared to other ATS) and to become dependent after a short period of time.

Continuation

Continuation generally referred to the phase after initiating ATS, and in some cases to the period after increased or decreased ATS use. The main use pattern in this phase was relatively stable and did not indicate a clear increase or decrease. Predominately the frequent users (group 3) and the non-frequent users (group 5) continued their ATS use at a more or less stable pace, indicating self-regulation. The core emphasis of these users was wanting to preserve the positive effects from ATS, using ATS use for pleasure and to occasionally escape their ‘normal’ life routine. As part of their lifestyle, they (regularly) used ATS use on weekend nights out. Continuation was also ascribed to the rather normalcy of ATS in participants’ social network. For some participants the continuation phase was related to functional use, for example, to cope with demands of everyday life (manage household, work), to feel more energetic or to lose weight (amphetamine).

Increase

The stories of the interviewees showed a fine line between continuation and increase, and for many, this went hand in hand, especially when referring to the phase after initiation. A rather common pattern was an increase in use frequency after the first couple of times using ATS. Associating more frequently with other ATS users often went together with increased use.

Group 3 and 4 members (CFU, FFU) reported increasing ATS use because of its effects in the party scene and also related it to becoming a more experienced user, getting more familiar with its effects, and combining ATS with other drugs.

For part of the participants increased use led to problematic and/or to dependent use and the line between non-problematic and problematic use was not always clear. Generally, patterns of use developed slowly from recreational to very frequent use, into the direction of problematic use, and/or dependence. While most interviewees with problematic use were by definition found in group 1 (CDU) and 2 (FDU), also a few group 3 (CFU) and 4 members (FFU) reported problematic (past) or compulsive use. Many problematic or dependent users linked it to underlying mental health problems, negative emotions, lack of self-confidence or a boring job. They often maintained frequent ATS consumption for several years. Methamphetamine users diverged: they generally increased their use rapidly towards daily use. Frequent speed users commonly reported drinking amounts of alcohol, and some of them developed alcohol dependence, which from their perspective was their major problem.

In the phase of increased frequent or excessive ATS use, side effects such as sleeping disorders, weight loss, memory loss and concentration problems were commonly reported. Other health issues included intensified feelings of depression, anxiety or paranoia. Many frequent users reported using cannabis or other substances to come down from the ATS effects, to be able to sleep and be fit for the week ahead. For some interviewees, their increased use negatively impacted daily responsibilities such as work, studies or childcare, or their social relationships: interactions with non-users were avoided.

ATS were generally easily available in the increase phase. Costs became challenging for some participants: while ATS were usually considered as rather affordable, dependent use meant higher costs and potential difficulties affording it. Few of these participants financed their use through debts, selling personal items, loan sharks, or (social) dealing.

Decrease and desistance

Decrease signified a stage when ATS use clearly shifted into non-frequent use, self-regulated use or abstinence from ATS. By definition, participants from group 4 (FFU) had already stopped their ATS use at the time of the interview. Yet many participants from the other groups also reported a period of decreased ATS use, which could result in desistance from ATS. Almost always, in participants' perspective decreased use referred to a lower frequency of use with reference to previous use, however, mainly some group 1 and 2 members (CDU, FDU) also mentioned less quantity/smaller doses. The length and underlying motives for decreased use were very varying from intended to unintended, from a short period to a longer time, from focusing on daily priorities to an unsuccessful attempt to use less often. Amongst dependent and frequent ATS users, side effects of ATS use and related health problems most often led to the decision to decrease or quit. These included severe physical exhaustion, panic attacks, blackouts, depression, lack of appetite, paranoia, and dental problems.

For some interviewees, mainly ATS dependent participants, the (mental) health problems had led to the decision to enter treatment. Rather often treatment was also used for alcohol problems partly related to excessive amphetamine use. Especially for methamphetamine dependent interviewees drug treatment became essential for their recovery. Some participants felt that the accessed treatment services were not sufficiently focused on ATS use. However, rather often treatment entries were also related to mental health disorders and multiple stressors around unemployment, poverty or domestic violence. In particular, females reported multiple stressors which were reported as difficult to desist from ATS without professional support.

Another commonly found pattern among decrease and desistance was gradually maturing out, particularly found in group 3. Responsibilities and priorities such as a new partner or a new job became more important, and/or nightlife considered boring after a while. Moreover, most of the women with children abstained from ATS during pregnancy, although some started reusing once their child was born.

When reflecting on their ATS career during the interview, some interviewees – group 3, 4 and 5 (CFU, FFU, NFU) – realized that they never made a hard decision regarding their ATS use, but that it gradually had been moved to the background of their daily life. Some of them had desisted from ATS, others used ATS only irregularly. For others, the phase of decrease or abstinence was challenging, especially the reorganization of priorities in life. They focused on studies and more often associated with nonusers (hedonistic users), or focused on parental responsibilities (women with children) or more generally on re-establishing daily routines, such as moving back to former hobbies or sports or finding new leisure interests. Particularly for dependent users reorganizing daily life and keeping distance to ATS-using environments was generally difficult. Some of them moved to another city, ended romantic relationships or avoided certain geographical areas. For a few ATS dependent users, imprisonment enforced abstinence.

Discussion

Our study showed that phases of ATS use and its users are diverse. Users have divergent motives for use, dynamic patterns of use with alternating phases of increase, continuation and decrease and different ways of and reasons for cessation. This heterogeneity is also a result of the diverse group of participants that we recruited by using a variety of recruitment strategies.

At initiation, use is often motivated by curiosity and pleasure-seeking, and sometimes to improve performance at work/studies or to cope with mental health problems. This is in line with previous studies (see for example Levy et al., 2005; Van Hout & Brennan, 2011). An increase in ATS use is often associated with an increasing orientation towards a drug-using environment (party lifestyle) or individual and social stressors such as a relationship breakup or mental issues (cf. Herman-Stahl et al., 2007; Levy et al., 2005). Occasional, controlled use was practiced by participants who prioritized everyday commitments and who used them on selected occasions. We also found mental health problems involved in most phases (cf. O'Donnell et al., 2019). Decrease or eventual cessation of ATS use was associated with

experiencing serious health effects of use and increased stress from neglecting work, family and relationships. Many but not all of those with dependent or problematic ATS use had been in counselling and treatment. In contrast, ATS users who used primarily at parties or during nightlife often matured out of ATS use. Thus, for some, desistance or decrease phases were induced by turning points such as imprisonment or a new job, yet for others there never had been a conscious decision to quit. Availability seemed not an issue, regardless of the type of user, phase or country, while previous studies linked limited availability of particularly methamphetamine to decrease (Bourne et al., 2015).

ATS use, in its different phases, may bring a variety of harms for people who use these substances. An increasing body of studies has analyzed and proposed prevention, treatment and harm reduction interventions for people who use ATS. Studies usually investigate the effectiveness of interventions for a specific substance, or form of administration, and pay less attention to the phase of ATS use in which such interventions can be beneficial. By combining the findings of our study with this scientific literature, we propose evidence-based interventions which can be beneficial to reduce the harms of ATS use in the different ATS trajectories. Table 2 summarizes the recommended interventions, which are further described below.

Table 2
Recommended interventions for different phases of ATS use

ATS trajectory phase	Potential support and interventions
Initial phase	• Evidence-based information on the effects and harms of ATS use • Peer-led outreach and drug education • Drug checking services • Promote safer social settings
Continuation	• (Peer-led) information and counselling • Drug checking services • Nightlife safer use services • Mental health support to help people cope with stressful life events • Foster self-management and control of drug use
Increase	• Mental health support to prevent increased/uncontrolled use • Skill-building, education and vocational training • Foster self-management and control of drug use • Drug checking services and nightlife safer use services • Assistance with basic symptomatic detoxification and withdrawal
Decrease/ desistance	• Support controlled drug use or abstinence • Ongoing therapeutic support for drug and alcohol dependence • Skill building, education and vocational training • Follow-up support after treatment
Dependent phase	• Harm reduction • Services related to social integration, rehabilitation and care (e.g., housing services, work integration, activation programmes, debt control) • Specialized, voluntary drug and alcohol dependence clinical treatment • Follow up support after treatment • Mental health support to help tackling (drug-related) problems • Medication-assisted withdrawal programmes • Substitution therapy if available and approved

Evidence-Based Information

Evidence-based information for ATS users about substances and their effects, and how to reduce potential harms of ATS use can be beneficial in several phases of ATS use. Important aspects to consider which information to provide are the motivations of specific groups for using the substance as well as users' perceived risks associated with use (Rigg, 2017). Other important information includes the potential consequences of mixing ATS with other drugs, including alcohol (Kinner et al., 2012), the possibility of engaging in high-risk sexual behaviors (Rigg & Lawental, 2018), and educating users about potential sleeping problems as well as hyperthermia (Docherty & Green, 2010).

Peer-based interventions

Peers can play an important role in the development and implementation of interventions. Therefore, peers with experience of ATS use and preferably, part of the same sub-groups of ATS users for whom the intervention is planned should be meaningfully involved in the design and the provision of information and education programmes. Several ATTUNE participants linked peers to their initiation, continuation and decrease in ATS use. Peer-based programmes can be very effective, as information and knowledge is experience-based and can contribute to the credibility of the intervention (e.g. Korf et al., 1999). Peers are more effective in engaging with users (Jozaghi et al., 2016), and more easily trusted, as they share experiences and background. Peer outreach work is particularly effective for safer drug use education (Jozaghi, 2014) and peers can also offer counselling for supported withdrawal, including providing information around the withdrawal process, helping to identify protective and risky factors in previous withdrawals, and helping identify key social supports (Jenner & Lee, 2008).

Self-management of drug use

People who use drugs, including those using various types of ATS, are often able to control their drug use in varying levels of success (Zinberg, 1984). Self-management of drug use can lead to less problematic patterns of use (Chavarria et al., 2012) and increases the chances of becoming and staying abstinent of drugs (Ferrari et al., 2009). Stimulant drugs users often create (informal) rules to self-manage their use according to perceived risk and triggers, such as only using when feeling well, using only with friends or during weekends, and establishing a maximum amount or frequency of use (Rigoni et al., 2018). While self-management can be learned, and supported by peers, it must build upon users' ability, empowering the skills and competencies they already use to control their use and reduce their risks (Zuffa & Ronconi, 2015).

Mental health support

Several people who use (certain) ATS do so to cope with difficulties and existing mental health problems (Fast et al., 2009). Frequent ATS use may also lead to mental harms such as depression, psychotic symptoms (hallucinations) and paranoid thoughts (Zweben et al., 2010). Moreover, chronic use is associated with high levels of psychiatric comorbidity (as depression, PTSD, ADHD, eating disorders and

suicidal thoughts/attempts) (Grund et al., 2010). Mental health support, thus, can be used in initial phases to help people cope with stressful life events and prevent increased/uncontrolled use (Scott et al., 2013), or in dependent or continued trajectories, to help tackling the mental harms (partly) due to extended drug use. The connection between drug use and mental health disorder is complex and an integrated approach is urgently needed. However, integrated care models are limited or do not exist at all.

Drug checking services and nightlife services

The illegal status of ATS often leads to unknown dosages and contents, increasing the risk of overdose as well as of other harms. In this context, drug checking and nightlife services can help to detect adulterants in substances, which can decrease users' intent to consume potentially dangerous substances, and help inform harm reduction efforts. These services can also be crucial for issuing preventative warnings (in case of dangerous adulterants), helping to avoid further harm. Nevertheless, drug checking alone might not be sufficient: especially less frequent users may require education about adulteration and drug-checking, and referral to support services and drug education are important facilitators of harm reduction intentions (Brunt & Niesink, 2011).

Safer Social settings

Interventions that are placed in and adapted to party settings can be very useful to engage ATS users in reducing harms, especially the ones in the initial phases of ATS consumption, but also those continuing or increasing use. Chill-out rooms at festivals or in clubs, for instance, can help MDMA users to increase their fluid intake and prevent hyperthermia, as well as warning users of the potential harm of overconsumption of fluids (Davies et al., 2018). Other practices include temperature control at the party venue, with adequate ventilation; provision of free cold water; staff training to understand and manage drug-related risks and emergencies; and adequate emergency provision (Transform, 2020).

Substitution therapy

Substitution therapy is an intervention used, in general, for a dependent pattern of drug use. While in the case of opiates drugs such as methadone and buprenorphine have been widely acknowledged as effective to substitute heroin, there is limited evidence of the benefit of pharmacotherapy for reducing ATS use. So far, studies have demonstrated only limited benefits for a few drugs, such as methylphenidate, bupropion, modafinil, and naltrexone (Lee et al., 2018).

Abstinence-based treatment and counselling

For those who are dependent on ATS and/or are willing to quit using, abstinence-based treatment and supportive counselling can be recommended. A few specific abstinence-based treatments have been developed for ATS, such as the Matrix model (Magidson et al., 2017). A specific structured brief counselling has been developed for regular methamphetamine users, and has proven to help increased abstinence, and manage the risks of tobacco smoking, polydrug use, risky injecting behavior, criminal activity, and psychiatric distress (Baker et al., 2005). Brief interventions have also shown to help reducing

MDMA use and severity of MDMA-related problems (Norberg et al., 2014) and promoting readiness to change (Huang et al., 2011). In any treatment chosen, follow-up after treatment completion is crucial.

Limitations and future research

There were some methodological differences between the countries regarding sample size, incentives given, and recruitment procedures. These methodological differences could have affected the final creation of the sample and with that the comparability of the data between the countries. While we did not structurally compare countries, and while countries probably have yielded different user types due to different ATS prevalence, for example methamphetamine is more prevalent in Czechia than in the Netherlands, findings between the countries were largely in accordance. Neither did we perform analyses of longitudinal patterns of use, i.e., change between the different phases. For the analysis no (true) distinctions were made between the type of ATS. Despite being aware of the differences between the different ATS substances and user groups, this procedure was chosen for emphasizing the phases of use.

For future research it might be interesting to focus more on motives and processes of decreasing ATS use. Especially studies which consider barriers and supportive factors within the phase of reducing or desistance of ATS use would contribute to the current lack of knowledge. Furthermore, it would be of major interest to learn more about the effectiveness of drug and alcohol treatment for ATS users, as services usually address drugs and alcohol problems in general, but our study showed that among dependent ATS users these often go along. Finally, an effect evaluation of the proposed set of interventions would be very beneficial regarding harm reduction for the different phases of ATS use.

Conclusions

This paper is among the first to give in-depth insights into patterns of ATS use and connect tailored interventions to the different phases of use, thereby giving practical tools regarding practice, prevention and policy. Our study showed that phases of ATS use and its users are diverse. Users have divergent motives for use, dynamic patterns of use with alternating phases of increase, continuation and decrease and different ways of and reasons for cessation. These findings demonstrate that tailor-made interventions are needed for the diverse user types and different phases or patterns of ATS use, to reduce possible harms of use. Based on the study findings and previous (evidence-based) studies and interventions we recommended a set of interventions for the different ATS phases. These include drug checking services, peer-led information and education, self-management of ATS use, mental health support to help people cope with stressful life events and prevent uncontrolled use, and follow-up support after treatment.

Declarations

Ethics approval and consent to participate

Before the interview, all participants provided informed consent and anonymity was guaranteed.

In GER, UK, PL and CZ, the study has been reviewed and approved by the respective responsible ethics committee; in NL, no ethical approval was required. The respective reference numbers are as follows: GER: WF-03/17; UK: 17/NE/0283; PL: 160_2017/2018; CZ: 180326_EK-NMS.

Consent for publication

Not applicable

Availability of data and materials

Due to the nature of this research, participants of this study did not agree for their data to be shared publicly, so supporting data is not available.

Competing interests

The authors declare that they have no competing interests.

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Contributions

NL wrote the wrote the first draft of the manuscript, completed revisions and managed the development of the manuscript. NL, BP, MR and HZ participated in the data collection and data analysis. RR and KS were major contributors in writing the manuscript. BP, MB, MR and HZ contributed to the further writing of the paper. All authors read and approved the final manuscript.

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References

1. Baker, A., Lee, N., Claire, M., & Lewin, T. (2005). Brief cognitive behavioural interventions for regular amphetamine users: a step in the right direction. *Addiction*, *100*, 367–378. https://doi.org/10.1111/j.1360-0443.2005.001002.x
2. Bavarian, N., Flay, B. R., Ketcham, P. L., & Smit, E. (2013). Illicit use of prescription stimulants in a college student sample: A theory-guided analysis. *Drug and Alcohol Dependence*, *132*(3), 665–673. https://doi.org/10.1016/j.drugalcdep.2013.04.024
3. Boeri, M. W., Harbry, L., & Gibson, D. (2009). A Qualitative Exploration of Trajectories Among Suburban Users of Methamphetamine. *Journal of Ethnographic and Qualitative Research*, *3*(3), 139–151. http://www.ncbi.nlm.nih.gov/pubmed/21552386
4. Boeri, M. W., Sterk, C. E., & Elifson, K. W. (2006). Baby Boomer Drug Users: Career Phases, Social Control, and Social Learning Theory*. *Sociological Inquiry*, *76*(2), 264–291. https://doi.org/10.1111/j.1475-682X.2006.00154.x
5. Bourne, A., Reid, D., Hickson, F., Torres-Rueda, S., Steinberg, P., & Weatherburn, P. (2015). “Chemsex” and harm reduction need among gay men in South London. *International Journal of Drug Policy*, *26*(12), 1171–1176. https://doi.org/10.1016/j.drugpo.2015.07.013
6. Bruno, R., Matthews, A. J., Topp, L., Degenhardt, L., Gomez, R., & Dunn, M. (2009). Can the Severity of Dependence Scale Be Usefully Applied to ‘Ecstasy”?’ *Neuropsychobiology*, *60*(3–4), 137–147. https://doi.org/10.1159/000253550
7. Brunt, T. M., & Niesink, R. J. M. (2011). The Drug Information and Monitoring System (DIMS) in the Netherlands: implementation, results, and international comparison. *Drug Testing and Analysis*, *3*(9), 621–634. https://doi.org/10.1002/dta.323
8. Bungay, V., Malchy, L., Buxton, J. A., Johnson, J., MacPherson, D., & Rosenfeld, T. (2006). Life with jib: A snapshot of street youth’s use of crystal methamphetamine. *Addiction Research and Theory*, *14*(3), 235–251. https://doi.org/10.1080/16066350500270901
9. Carbone-Lopez, K., Owens, J. G., & Miller, J. (2012). Women’s “Storylines” of Methamphetamine Initiation in the Midwest. *Journal of Drug Issues*, *42*(3), 226–246. https://doi.org/10.1177/0022042612456013
10. Chavarria, J., Stevens, E. B., Jason, L. A., & Ferrari, J. R. (2012). The Effects of Self-Regulation and Self-Efficacy on Substance Use Abstinence. *Alcohol Treat Q*, *30*(4), 422–432. https://doi.org/10.1111/j.1743-6109.2008.01122.x.Endothelial

11. Cheney, A. M., Newkirk, C. N., Nekhavhambe, V. M., Rotondi, M. B., & Hamilton, A. (2018). Effects of social and spatial contexts on young latinas' methamphetamine use initiation. *Journal of Ethnicity in Substance Abuse*, *17*(1), 32–49. https://doi.org/10.1080/15332640.2017.1362721
12. Davies, N., English, W., & Grundlingh, J. (2018). MDMA toxicity: management of acute and life-threatening presentations. *British Journal of Nursing (Mark Allen Publishing)*, *27*(11), 616–622. https://doi.org/10.12968/bjon.2018.27.11.616
13. Degenhardt, L., Baxter, A. J., Lee, Y. Y., Hall, W., Sara, G. E., Johns, N., Flaxman, A., Whiteford, H. A., & Vos, T. (2014). The global epidemiology and burden of psychostimulant dependence: Findings from the Global Burden of Disease Study 2010. *Drug and Alcohol Dependence*, *137*(1), 36–47. https://doi.org/10.1016/j.drugalcdep.2013.12.025
14. Ding, Y., He, N., & Detels, R. (2013). Circumstances of initiation into new-type drug use among adults in Shanghai: Are there differences by types of first new-type drug used? *Drug and Alcohol Dependence*, *131*(3), 278–283. https://doi.org/10.1016/j.drugalcdep.2012.12.019
15. Docherty, J. R., & Green, A. R. (2010). The role of monoamines in the changes in body temperature induced by 3,4-methylenedioxymethamphetamine (MDMA, ecstasy) and its derivatives. *British Journal of Pharmacology*, *160*(5), 1029–1044. https://doi.org/10.1111/j.1476-5381.2010.00722.x
16. Duff, C., & Moore, D. (2015). Evading and embracing normality: estrangement and ambivalence in the accounts of methamphetamine consumers. *Critical Public Health*, *25*(4), 488–503. https://doi.org/10.1080/09581596.2014.913785
17. Eiserman, J. M., Diamond, S., & Schensul, J. J. (2005). "Rollin" on E": A qualitative analysis of ecstasy use among inner city adolescents and young adults." *Journal of Ethnicity in Substance Abuse*, *4*(2), 9–38. https://doi.org/10.1300/J233v04n02_02
18. EMCDDA. (2020). *European Drug Report 2020: Trends and Developments.* Publications Office of the European Union.
19. Farrell, M., Martin, N. K., Stockings, E., Bórquez, A., Cepeda, J. A., Degenhardt, L., Ali, R., Tran, L. T., Rehm, J., Torrens, M., Shoptaw, S., & McKetin, R. (2019). Responding to global stimulant use: challenges and opportunities. *The Lancet*, *394*(10209), 1652–1667. https://doi.org/10.1016/S0140-6736(19)32230-5
20. Fast, D., Small, W., Wood, E., & Kerr, T. (2009). Coming "down here": Young people's reflections on becoming entrenched in a local drug scene. *Social Science and Medicine*, *69*(8), 1204–1210. https://doi.org/10.1016/j.socscimed.2009.07.024
21. Ferrari, J. R., Stevens, E. B., & Jason, L. A. (2009). The role of self-regulation in abstinence maintenance: Effects of communal living on self-regulation. *Journal of Groups in Addiction and Recovery*, *4*(1–2), 32–41. https://doi.org/10.1080/15560350802712371
22. Fisher, A. H., & Stanciu, C. N. (2017). Amphetamine-Induced Delusional Infestation. *The American Journal of Psychiatry Residents' Journal*, *December*, 12–13. https://doi.org/10.1176/appi.ajp-rj.2017.121204

23. Gossop, M., Darke, S., Griffiths, P., Hando, J., Powis, B., Hall, W., & Strang, J. (1995). The Severity of Dependence Scale (SDS): psychometric properties of the SDS in English and Australian samples of heroin, cocaine and amphetamine users. *Addiction*, *90*(5), 607–614. https://doi.org/10.1046/j.1360-0443.1995.9056072.x
24. Grund, J.-P., Coffin, P., Jauffret-roustide, M., Dijkstra, M., de Bruin, D., & Blanken, P. (2010). The fast and furious — cocaine , amphetamines and harm reduction. In T. Rhodes & D. Hedrich (Eds.), *Harm Reduction: evidence, impacts and challenges* (EMCDDA Mon, pp. 191–232). Luxembourg: Publications Office of the European Union.
25. Harm Reduction International. (2020). *The Global State of Harm Reduction 2020*. https://www.hri.global/files/2020/10/26/Global_State_HRI_2020_BOOK_FA.pdf
26. Hearne, E., Grund, J.-P. C., Van Hout, M. C., & McVeigh, J. (2016). A scoping review of home-produced heroin and amphetamine-type stimulant substitutes: implications for prevention, treatment, and policy. *Harm Reduction Journal*, *13*(1), 14. https://doi.org/10.1186/s12954-016-0105-2
27. Herman-Stahl, M. A., Krebs, C. P., Kroutil, L. A., & Heller, D. C. (2007). Risk and protective factors for methamphetamine use and nonmedical use of prescription stimulants among young adults aged 18 to 25. *Addictive Behaviors*, *32*(5), 1003–1015. https://doi.org/10.1016/j.addbeh.2006.07.010
28. Ho, H. T., Le, G. M., & Dinh, T. T. (2013). Female sex workers who use amphetamine-type stimulants (ATS) in three cities of Vietnam: Use and sexual risks related to HIV/AIDS. *Global Public Health*, *8*(5), 552–569. https://doi.org/10.1080/17441692.2013.790459
29. Huang, Y.-S., Tang, T.-C., Lin, C.-H., & Yen, C.-F. (2011). Effects of motivational enhancement therapy on readiness to change MDMA and methamphetamine use behaviors in Taiwanese adolescents. *Substance Use & Misuse*, *46*(4), 411–416. https://doi.org/10.3109/10826084.2010.501664
30. Hunter, C., Strike, C., Barnaby, L., Busch, A., Marshall, C., Shepherd, S., & Hopkins, S. (2012). Reducing widespread pipe sharing and risky sex among crystal methamphetamine smokers in Toronto: do safer smoking kits have a potential role to play? *Harm Reduction Journal*, *9*(1), 9. https://doi.org/10.1186/1477-7517-9-9
31. Jenner, L., & Lee, N. (2008). *Treatment Approaches for Users of Methamphetamine: A Practical Guide for Frontline Workers*.
32. Jozaghi, E. (2014). The role of drug users' advocacy group in changing the dynamics of life in the Downtown Eastside of Vancouver, Canada. *Journal of Substance Use*, *19*(1–2), 213–218. https://doi.org/10.3109/14659891.2013.775608
33. Jozaghi, E., Lampkin, H., & Andresen, M. A. (2016). Peer-engagement and its role in reducing the risky behavior among crack and methamphetamine smokers of the Downtown Eastside community of Vancouver, Canada. *Harm Reduction Journal*, *13*(1), 19. https://doi.org/10.1186/s12954-016-0108-z
34. Kerley, K. R., Leban, L., Copes, H., Taylor, L., & Agnone, C. (2014). Methamphetamine Using Careers of White and Black Women. *Deviant Behavior*, *35*(6), 477–495. https://doi.org/10.1080/01639625.2013.859046

35. Kinner, S. A., George, J., Johnston, J., Dunn, M., & Degenhardt, L. (2012). Pills and pints: risky drinking and alcohol-related harms among regular ecstasy users in Australia. *Drug and Alcohol Review*, *31*(3), 273–280. https://doi.org/10.1111/j.1465-3362.2011.00348.x
36. Korf, D. J., Riper, H., Freeman, M., Lewis, R., Grant, I., Jacob, E., Mougin, C., & Nilson, M. (1999). *Outreach work among drug users in Europe : concepts, practice and terminology*. Office for Official Publications of the European Communities.
37. Lee, N. K., Jenner, L., Harney, A., & Cameron, J. (2018). Pharmacotherapy for amphetamine dependence: A systematic review. *Drug and Alcohol Dependence*, *191*, 309–337. https://doi.org/10.1016/j.drugalcdep.2018.06.038
38. Levy, K. B., O'Grady, K. E., Wish, E. D., & Arria, A. M. (2005). An in-depth qualitative examination of the ecstasy experience: Results of a focus group with ecstasy-using college students. *Substance Use and Misuse*, *40*(9–10), 1427–1441. https://doi.org/10.1081/JA-200066810
39. Liebregts, N. (2018). Nuts and bolts of timelines in qualitative drug research. In G. J. Potter, J. Fountain, & D. J. Korf (Eds.), *Place, space and time in European drug use, markets and policy*. Lengerich: Pabst Science Publishers. https://www.narcis.nl/publication/RecordID/oai:dare.uva.nl:publications%2Ff5898e4b-9c3c-4477-abe4-99aa1c58cf71
40. Liebregts, N., van der Pol, P., Van Laar, M., de Graaf, R., van den Brink, W., & Korf, D. J. (2013). The Role of Study and Work in Cannabis Use and Dependence Trajectories among Young Adult Frequent Cannabis Users. *Frontiers in Psychiatry*, *4*(AUG), 85. https://doi.org/10.3389/fpsyt.2013.00085
41. Magidson, J. F., Gouse, H., Burnhams, W., Wu, C. Y. Y., Myers, B., Joska, J. A., & Carrico, A. W. (2017). Beyond methamphetamine: Documenting the implementation of the Matrix model of substance use treatment for opioid users in a South African setting. *Addictive Behaviors*, *66*, 132–137. https://doi.org/https://doi.org/10.1016/j.addbeh.2016.11.014
42. Martens, M. S., Zurhold, H., Rosenkranz, M., O'donnell, A., Addison, M., Spencer, L., McGovern, W., Gabrhelík, R., Petruželka, B., Rowicka, M., Liebregts, N., Degkwitz, P., Kaner, E., & Verthein, U. (2020). Using life course charts to assess and compare trajectories of amphetamine type stimulant consumption in different user groups: A cross-sectional study. *Harm Reduction Journal*, *17*(1). https://doi.org/10.1186/s12954-019-0339-x
43. Nichter, M., Quintero, G., Nichter, M., Mock, J., & Shakib, S. (2004). Qualitative research: Contributions to the study of drug use, drug abuse, and drug use(r)-related interventions. In *Substance Use and Misuse* (Vol. 39, Issues 10–12, pp. 1907–1969). Subst Use Misuse. https://doi.org/10.1081/JA-200033233
44. Norberg, M. M., Hides, L., Olivier, J., Khawar, L., McKetin, R., & Copeland, J. (2014). Brief interventions to reduce Ecstasy use: a multi-site randomized controlled trial. *Behavior Therapy*, *45*(6), 745–759. https://doi.org/10.1016/j.beth.2014.05.006
45. O'Brien, A. M., Brecht, M. L., & Casey, C. (2008). Narratives of methamphetamine abuse: A qualitative exploration of social, psychological, and emotional experiences. *Journal of Social Work Practice in*

the Addictions, *8*(3), 343–366. https://doi.org/10.1080/15332560802224469

46. O'Donnell, A., Addison, M., Spencer, L., Zurhold, H., Rosenkranz, M., McGovern, R., Gilvarry, E., Martens, M. S., Verthein, U., & Kaner, E. (2019). Which individual, social and environmental influences shape key phases in the amphetamine type stimulant use trajectory? A systematic narrative review and thematic synthesis of the qualitative literature. In *Addiction* (Vol. 114, Issue 1, pp. 24–47). Blackwell Publishing Ltd. https://doi.org/10.1111/add.14434
47. Rigg, K. K. (2017). Motivations for Using MDMA (Ecstasy/Molly) among African Americans: Implications for Prevention and Harm-Reduction Programs. *Journal of Psychoactive Drugs*, *49*(3), 192–200. https://doi.org/10.1080/02791072.2017.1305518
48. Rigg, K. K., & Lawental, M. (2018). Perceived Risk Associated with MDMA (Ecstasy/Molly) Use among African Americans: What Prevention and Treatment Providers Should Know. *Substance Use & Misuse*, *53*(7), 1076–1083. https://doi.org/10.1080/10826084.2017.1392985
49. Rigoni, R., Breeksema, J., & Woods, S. (2018). *Speed limits. Harm reduction for people who use stimulants*. Mainline Foundation.
50. Rigoni, R., Woods, S., & Breeksema, J. J. (2019). From opiates to methamphetamine: building new harm reduction responses in Jakarta, Indonesia. *Harm Reduction Journal*, *16*(1), 67. https://doi.org/10.1186/s12954-019-0341-3
51. Rosenkranz, M., O'Donnell, A., Verthein, U., Zurhold, H., Addison, M., Liebregts, N., Rowicka, M., Barták, M., Petruželka, B., Kaner, E. F., & Martens, M. S. (2019). Understanding pathways to stimulant use: a mixed-methods examination of the individual, social and cultural factors shaping illicit stimulant use across Europe (ATTUNE): study protocol. *BMJ Open*, *9*(8), e029476. https://doi.org/10.1136/bmjopen-2019-029476
52. Scott, R. M., Hides, L., Allen, J. S., & Lubman, D. I. (2013). Coping style and ecstasy use motives as predictors of current mood symptoms in ecstasy users. *Addictive Behaviors*, *38*(10), 2465–2472. https://doi.org/10.1016/j.addbeh.2013.05.005
53. Sexton, R. L., Carlson, R. G., Leukefeld, C. G., & Booth, B. M. (2008). Trajectories of methamphetamine use in the rural south: A longitudinal qualitative study. *Human Organization*, *67*(2), 181–193. https://doi.org/10.17730/humo.67.2.h457132482255391
54. Smirnov, A., Najman, J. M., Hayatbakhsh, R., Wells, H., Legosz, M., & Kemp, R. (2013). Young adults' recreational social environment as a predictor of ecstasy use initiation: findings of a population-based prospective study. *Addiction*, *108*(10), 1809–1817. https://doi.org/10.1111/add.12239
55. Sterk, C. E., Theall, K. P., & Elifson, K. W. (2007). Getting Into Ecstasy: Comparing Moderate and Heavy Young Adult Users. *Journal of Psychoactive Drugs*, *39*(2), 103–113. https://doi.org/10.1080/02791072.2007.10399869
56. Transform. (2020). *How to regulate Stimulants. A practical guide.*
57. United Nations. (2020). *World Drug Report 2020*. https://wdr.unodc.org/wdr2020/
58. Van Hout, M. C., & Brennan, R. (2011). Plant food for thought: A qualitative study of mephedrone use in Ireland. *Drugs: Education, Prevention and Policy*, *18*(5), 371–381.

https://doi.org/10.3109/09687637.2010.537713

59. WHO. (2011). *Technical Briefs 2 on amphetamine-type stimulants (ATS). Harm reduction and brief interventions for ATS users*.
60. Zinberg, N. E. (1984). *Drug, Set, and Setting. The Basis for Controlled Intoxicant Use*. Yale University Press.
61. Zuffa, G., & Ronconi, S. (2015). Cocaine and stimulants, the challenge of self-regulation in a harm reduction perspective. *Epidemiology Biostatistics and Public Health*, *12*(1), e-1-e-8. https://doi.org/10.2427/11175
62. Zweben, J., Cohen, J., Christian, D., Pharm, G. G., Salinardi, M., Parent, D., & Iguchi, M. (2010). Psychiatric Symptoms in Methamphetamine Users. *The American Journal on Addictions*, *13*(2), 181–190. https://doi.org/10.1080/10550490490436055