

Adolescence and Drug Use

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Introduction

Adolescence is a period of life characterized by significant physical, psychological, cognitive and social changes. It is a time of construction of an individual sense of self; an era of idealism, experience, and development of personal values. The (needed) changes are so intense and in so many levels, that the presence of some “turbulence” is more the norm than the exception.

In this context, experiencing with substances is common and, in most cases, represent sporadic and non-pathological situations¹. However, if the consumptions become frequent and have a significant impact on the personal, familial and social lives of young people^{2,3}, they constitute a problem prone to acquire abuse or dependence contours.

The use of substances in early age has been associated with increased durability and severity of consumption⁴. In addition, about 60% of adult drug users and 80% of alcohol and tobacco use in adulthood began at, or below, age 18⁴. This is even more important if we consider that the substance use by teens and preteens brings immediate and long-term risks, both physically and psychologically⁴.

Thus, one can conclude that substance consumption in adolescence represents a real public health problem resulting in increased costs for young people, families and health systems.

This chapter is a brief overview of the general context of consumption of substances in adolescence, addressing aspects inherent to its development and its consequences.

Adolescence and risks

Adolescence is characterized by identity construction, progressive gain of autonomy from parents and adoption of a set of certain roles and values. During this quest to finding themselves and their place in the world, teenagers make experiences, oppose against the rules and seek to test limits. So, there is a significant increase in risk-taking behaviours⁵. Experiencing with substances often makes part of this “search for identity” – common in adolescents in Western societies (especially in males) and an occasional standard^{1,2}.

Longitudinal studies across adolescence demonstrate increases in substance use from early to late adolescence and decreases thereafter⁶. In fact, although most individuals with addictive patterns begun their consumption in adolescence, only a small proportion of adolescents become dependent^{1,2}.

In 2011, Portugal seemed to follow the European tendency concerning the most used substances in adolescence: tobacco, alcohol and cannabis were on the top of the list of the substances used by teenagers, followed by amphetamines⁴. Furthermore, as in other countries, simultaneous use of substances, including alcohol and drugs, is increasingly frequent⁴.

The adolescent brain is still developing and the different neural circuits don't mature simultaneously. On the one hand, dopaminergic hyperactivation involved in reward mechanisms promotes greater sensitivity to immediate satisfaction and the pursuit of pleasure⁵. On the other hand, teens show greater difficulty in emotional regulation and behaviour, being naturally more impulsive and more likely to seek new sensations^{1,3}. All these factors, associated with susceptibility to boredom (from which adolescents want to distance) and with a variety of other individual, familial and environmental risk factors (**Table 1**), lead to an increased propensity for additive behaviour^{1,3}.

Table 1. Risk factors for substance consumption^{1,4}

INDIVIDUAL	FAMILY	ENVIRONMENT
<ul style="list-style-type: none"> • Males; • Genetic; • Personality traits (disinhibition, impulsivity, sensation seeking, anti-social); • Psychopathology (Oppositional/defiant disorder, conduct disorder, hyperactivity and attention deficit disorder, mood disorders, anxiety disorders, post-traumatic stress disorder). 	<ul style="list-style-type: none"> • Substance use by parents and/or siblings; • Parental conflict; • Permissive or authoritarian educational style; • Low parental supervision; • Attachment disorders. 	<ul style="list-style-type: none"> • Association with peers with disruptive behaviour; • Rejection by peers; • Lower levels of connection to school and school failure; • Belonging to cultural/ethnic minorities; • Poverty; • Exposure to early traumatic events (separation, loss, abuse).

In general, the use of substances in adolescence occurs in the context of peer group and in recreational settings such as bars/clubs and parties¹⁻³. The motivations that involve the occasional consumption of substances are mainly curiosity, seeking for sensations and momentary satisfaction^{1,2}. Alcohol and drugs represent a quick road for fun and pleasure, either achieved by the substance directly (disinhibition, reassurance) or through the behaviour triggered or facilitated by it, such as greater ease in social interaction and status within the group^{1,7}.

There are cases, however, when consumption tends to get more pathological contours and become more regular as a way to “escape” and to cope with negative life events. In these situations, substance use can be made in isolation, by oneself, and have a negative impact on school and social functioning^{2,3,7}.

THE “OLD” SUBSTANCES

Main Characteristics of specific substances^{4,8}

ALCOHOL Although a legal substance, it is used as a drug by many, changing their perception of reality. Prevalence of alcohol use is about eight times greater than that of illegal substances⁹.

Adolescents drink to socialize, to celebrate and to relax. The alcohol's effect on youngsters depends on a variety of factors including the quantity and frequency of consumption, and the individual's age, sex and health status. Usually, it's use is combined with other substances.

CANNABIS (Street names - Blunt, Bud, Dope, Ganja, Grass, Green, Herb, Joint, Mary Jane, Pot, Reefer, Sinsemilla, Skunk, Smoke, Trees, Weed; Hashish: Boom, Gangster, Hash, Hemp).

It is the most consumed illegal drug across the world. In many countries it is cultivated in greenhouses, being more accessible to everyone.

Marijuana (Cannabis) is made from the hemp plant, *Cannabis Sativa*. It is a mixture of dried, shredded leaves, stems, seeds, and/or flowers. Hashish is a resin or an oil (hashish) or a sticky, black liquid (hash oil). The main psychoactive (mind-altering) chemical in both forms is delta-9-tetrahydrocannabinol (THC).

It can be smoked alone or with tobacco (in a “joint”, a “spliff”, a pipe, or a “bong”) or eaten (mixed in food or brewed as tea).

Possible Health Effects:

Short-term: Cannabis enhances sensory perception and causes euphoria followed by drowsiness/relaxation. It slows reaction time and problems with balance and coordination can be present. It increases heart rate and appetite. One can experience problems with learning and memory. Anxiety and panic attacks are not infrequent. A first psychotic episode with the presence of hallucinations and delusions can take place.

Long-term: Mental health problems such as amotivational syndrome can be present (psychological condition associated with diminished inspiration to participate in social situations and activities, with episodes of apathy.) Chronic cough and frequent respiratory infections can be present especially when used combined with tobacco.

Youth: There is a possible loss of intelligence quotient (IQ) points when repeated use begins in adolescence.

In Combination with Alcohol: Increased heart rate and blood pressure. There is a further slowing of mental processing and reaction time.

Withdrawal Symptoms: Irritability, troubled sleep, decreased appetite and anxiety can be present.

COCAINE (Street names - Blow, Bump, C, Candy, Charlie, Coke, Crack, Flake, Rock, Snow, Toot).

It is a powerful addictive stimulant drug made from the leaves of the coca plant native to South America. It can be found as a white powder or as a freebase and crack. It gives the user energy, a feeling of happiness and overconfidence and the capacity of being wide awake.

Freebase and crack can be smoked, and powder cocaine can be inhaled. Both cocaine and crack can be prepared for injecting.

Possible Health Effects:

Short-term: It narrows blood vessels and enlarges pupils. It increases body temperature, heart rate (heart rhythm problems and heart attack can occur) and blood pressure. Strokes and seizures can take place. It can cause headaches. Both abdominal pain and nausea can be present. Euphoria, increased energy and alertness are main symptoms. It causes insomnia and restlessness. Anxiety and panic attacks can also be found, as more severe psychiatric symptoms such as paranoia and psychosis (in the form of an episode of mania). The behaviour can be erratic and violent.

Long-term: A loss of sense of smell with nosebleeds and nasal damage (when inhaled it can injury the cartilage of the nose) are frequent, but lesion of the vocal chords can also be found. Weight loss and poor nutrition from decreased appetite can take place. Infections can be present and are caused by a decreased blood flow – death from bowel tissue infarction (mesenteric infarction) can occur.

In Combination with Alcohol: The risks of overdose and sudden death are greater than from either drug alone.

Withdrawal Symptoms: Depression, tiredness, increased appetite, insomnia, vivid unpleasant dreams, slowed thinking and movement, and restlessness can occur.

HEROIN (Street names - Brown sugar, China White, Dope, H, Horse, Junk, Skag, Skunk, Smack, White Horse).

It is an opioid drug made from morphine a natural substance extracted from the seed pod of the Asian opium poppy plant. It is either a white or brownish powder, or a black sticky substance. It can be inhaled, injected or smoked. It causes relaxation.

Possible Health Effects:

Short-term: It can cause nausea and vomiting. The heart rate and respiratory frequency are slowed. A warm flushing of skin, dry mouth, itching and a heavy feeling in the hands and feet can occur. Symptoms such as euphoria, clouded thinking and alternate wakeful and drowsy states can be present.

Long-term: When injected, the veins can collapse and abscesses can be present. There can be also an infection of the lining and valves in the heart. Constipation and stomach cramps can be present. Liver or kidney diseases and pneumonia can be found.

In Combination with Alcohol: There is a dangerous slowdown of heart rate and breathing that can cause coma and death.

Withdrawal Symptoms: Restlessness, muscle and bone pain, insomnia, diarrhoea, vomiting, cold flashes with goose bumps (“cold turkey”) and leg movements can be present.

INHALANTS (Street names - Poppers, Snappers, Whippets, laughing gas).

Products such as solvents, aerosols, gases found in household products (e.g. spray paints, markers, glues, and cleaning fluids) and nitrites (e.g. amyl nitrite, present in prescription medications for chest pain) can be inhaled through the nose or the mouth. They are easily accessible and cheap, making them a good choice for younger adolescents. These substances cause euphoria.

Possible Health Effects:

Short-term: Symptoms such as confusion, nausea, slurred speech, lack of coordination, euphoria, dizziness, drowsiness, disinhibition, light headedness, hallucinations/delusions and headaches can be found. Sudden death, either due to heart failure (e.g. caused by butane, propane, and other chemicals in aerosols) or due to asphyxiation can occur. When squirting gas products down the throat, they can cause a throat swell. A red rash around the mouth can also be found. Convulsions/seizures, coma, or choking are not infrequent. Nitrites cause an enlargement of the blood vessels which enhance sexual pleasure and increase heart rate, causing a brief sensation of heat and excitement, dizziness and headache.

Long-term: Liver, kidney and bone marrow damage can be found. Limb spasms (due to nerve damage) and brain damage (from lack of oxygen) can negatively impact thinking processes, moving, seeing, and hearing. Nitrites increase the risk of pneumonia.

In Combination with Alcohol: significant low blood pressure.

Withdrawal Symptoms: Nausea, loss of appetite, sweating, tics, troubled sleeping and mood changes can be found.

LSD (lysergic acid diethylamide)

It is a hallucinogen manufactured from lysergic acid found in ergot a fungus that grows on rye and other grains. It can be swallowed or absorbed through mouth tissues (paper squares).

Possible Health Effects:

Short-term: It causes rapid emotional swings and a distortion or inability to recognize reality, to think rationally or to communicate with others. It raises blood pressure, heart rate and body temperature, and causes dizziness, insomnia, loss of appetite, dry mouth, sweating, numbness, weakness, tremors and enlarged pupils.

Long-term: It can provoke frightening flashbacks (called Hallucinogen Persisting Perception Disorder [HPPD]), ongoing visual disturbances, disorganized thinking, paranoia and mood swings.

In Combination with Alcohol: May decrease the perceived effects of alcohol.

MDMA (Ecstasy - 3,4-methylenedioxy-methamphetamine) (Street names - Adam, Clarity, Eve, Lover's Speed, Peace, Uppers).

It is a synthetic, psychoactive drug that has similarities to both the stimulant amphetamine and the hallucinogen mescaline. It can be swallowed or inhaled.

Possible Health Effects:

Short-term: It lowers inhibition, making consumers act affectionately and chatty. It enhances sensory perception (colours and sounds become more vivid). It can cause confusion, depression, sleep problems and anxiety. It increases heart rate and blood pressure. It can cause muscle tension, teeth clenching, nausea, blurred vision, faintness, chills, sweating and a sharp rise in body temperature (risk leading to liver, kidney or heart failure and death).

Long-term: It can cause long-lasting confusion, depression and problems with attention, memory and sleep. It can increase anxiety, impulsiveness and aggression. Loss of appetite and less interest in sex can appear.

In Combination with Alcohol: May increase the risk of cell and organ damage.

Withdrawal Symptoms: Fatigue, loss of appetite, depression and trouble concentrating may be present.

SPEED (Street Names - Bennies, Black Beauties, Crosses, Hearts, LA Turn-around, Speed, Truck Drivers, Uppers, Amphetamine, JIF, MPH, R-ball, Skippy, The Smart Drug, Vitamin R. Commercial names – Methylphenidate)

These substances increase alertness, give confidence and energy but can also make one aggressive and provoke confusion and paranoia. They can cause heart attack and high blood pressure.

It may have many forms: powder (off-white or pink), liquid, tablet, chewable tablet or capsule. They can be rubbed on gums, inhaled, swallowed (paper or pills), smoked and injected.

Possible Health Effects:

Short-term: They increase alertness, attention and energy. They also increase blood pressure and heart rate. They narrow blood vessels, increase blood sugar and dilate breathing passages. When used in high doses they can dangerously increase body temperature and cause irregular heartbeat and heart failure. Seizures can also be present.

Long-term: Heart dysfunction, psychosis, anger and paranoia can be found.

In Combination with Alcohol: It masks the depressant action of alcohol, increasing risk of alcohol overdose. It may increase blood pressure and jitters.

Withdrawal Symptoms: Depression, tiredness and sleep problems can be present.

Treatment Options (for all groups mentioned):

Medications: Except for heroin use, for which we can use methadone, buprenorphine or naltrexone (short and long-acting forms) there are no medications to treat other addictions.

Behavioural Therapies: Have been showing some results, as well as motivational interventions.

THE “NEW” SUBSTANCES

In the last few decades new drugs have emerged. These substances are referred in the literature as “novel psychoactive substances” (NPS), but known as “smart drugs” or “legal highs” by users¹⁰⁻¹³. These substances, of natural or synthetic origin, are often intentionally created pharmacological analogues of compounds prohibited under current drug laws, such as amphetamines and cannabis, and sold as products “not for human consumption”¹⁰⁻¹⁶. The novel substances are easily obtainable through the Internet and “smart shops” or “head shops”^{11-14,16}. NPS are used mainly by younger people (15-24 years old) and are associated with recreational consumption at weekends and parties^{10,12,15,16}.

There has been hardly any clinical research into NPS, and most of them are not detectable in common tests^{12,17}. So, very little is known about their psychopharmacological effects and their acute and long-term risks¹⁸. NPS are possibly responsible for serious physical and mental problems^{10,12}. In fact, recent data indicates that some agents may be more harmful than their more stable “parent” compound in terms of risk of dependency and overdose, and of long term health impacts.

These drugs can be divided in five main groups, based on their “parent” compound: psychostimulants, those that mimic the effects of cannabis, those based upon benzodiazepines, those that produce dissociative effects similar to ketamine or phencyclidine, and those that are analogues of hallucinogens¹⁸.

PSYCHOSTIMULANTS: Like traditional psychostimulants (amphetamine, cocaine and MDMA), these drugs target primarily monoaminergic systems, leading to increased extracellular levels of serotonin and dopamine (in mesolimbic reward pathway) and/or noradrenaline (which may significantly contribute to in-

creased activity of the sympathetic nervous system and cardiovascular risks). The most common are piperazine and cathinone derivatives, as well as aminoidanes¹⁸.

Piperazine derivatives: These drugs are similar to MDMA (ecstasy) and can be administered orally (“party pills”)^{12,19}. Their possible effects include anxiety, euphoric reactions, psychomotor agitation, decreased need for sleep, palpitations, nausea, vomiting and confusion^{12,19}. In some cases, serious hyperthermia, rhabdomyolysis, renal failure, seizures and even death can occur^{12,19}.

Cathinone derivatives: These drugs, the most known mephedrone, are similar to MDMA and cocaine, replacing their use^{12,14,16,19}, usually administered nasally^{14,16,19}, and sold as “bath salts,” “plant foods,” “glass cleaners” or “research chemicals”^{11,12,16,19}. Their possible effects include agitation, euphoria, increased libido, bruxism, sweating, overheating, blurred vision, shortness of breath, epistaxis, loss of appetite, nausea and insomnia^{12,14,16,19,20}. Adverse clinical effects are related to neurologic (seizures, confusion), psychiatric (psychotic symptoms) and cardiovascular (tachycardia, palpitations, raised blood pressure, chest pain) symptoms^{12,14,16,19,20}. Also, studies in animals predict a high potential for addiction and abuse in users^{14,20}. These agents are also liable to cause acute withdrawal effects upon cessation of use mephedrone withdrawal effects include tiredness, insomnia, flu-like symptoms, irritability, difficulties in concentration, cravings, disordered mood including and anxiety¹⁸.

CANNABINOID RECEPTOR AGONISTS: Result of a mixture of dried plants and synthetic cannabinoids, sold as “herbal blends”, “air fresheners” or “incense” products under a variety of brand names (as Spice and K2)^{12,16,17}. They are, along with novel stimulants, amongst the most popular of NPS. Their affinity to cannabinoid receptors can be higher than cannabis itself¹⁶. The most common clinical effects reported were tachycardia, agitation/irritability, vomiting, drowsiness/lethargy, confusion, nausea, changes in sensation, induction of both positive and negative mood states, cognitive impairments, anxiety, hypertension, dizziness/vertigo, palpitations and chest pain and appetite stimulation^{12,16,18}. As THC, these NPS increase dopamine activity in striatal dopaminergic regions, which can be central to the development of acute and sometimes long-term psychotic symptoms. Curiously, unlike prototypical cannabis effects, users also report that cannabinoid NPS can induce “hangover-like” states. Moreover, whilst cannabis is generally regarded nonlethal (consumption of considerable amounts to risk an overdose), this has not been confirmed for its NPS counterpart, with evidence for more severe effects than THC. There have been reported serious presentations including renal and pulmonary damage and seizures¹⁸.

BENZODIAZEPINES: In recent years, internet purchasing has led to some benzodiazepines, notably phenazepam and etizolam not licensed in most Western nations appearing worldwide. Namely, phenazepam is sometimes available under the name “bonsai” or “bonsai supersleep”. It was followed by several more recently synthesized NPS benzodiazepines, such as pyrazolam (the first novel benzodiazepine to appear as an NPS), flubromazepam and iso-flubromazepam. Currently, NPS benzodiazepines remain amongst the least-well-categorized and elucidated of the NPS.

As benzodiazepines, these NPS show four major effects: anxiolytic, hypnotic, muscle-relaxant and anticonvulsive. Intoxication is very similar to that of alcohol, with individuals variously disinhibited, cognitively impaired, with slurred speech and impaired motor control. They are respiratory depressants, which, at high doses, may lead to fatal overdoses, particularly when combined with substances such as alcohol or opiates¹⁸.

DISSOCIATIVES: Include ketamine (“Special K”, “K” or “Ket”) and phencyclidine (often referred as “angel dust”) and act mainly as uncompetitive antagonists, through open channel blockade, of the glutamate ionotropic NMDA receptor (NMDAR).

Recreational users (>25%) report dizziness, dissociation from the environment and from the body, auditory and visual hallucinations, confusion, excitement, loosening of associations, unusual thought content, impaired memory, euphoria, visual distortions, novel bodily sensations, weightlessness and other altered body perceptions, and a sense of loss of notion of time. The most commonly reported physiological effects (>25%) were increased heart rate, nausea, vomiting, pyrexia, blurred vision, impaired speech and analgesia¹⁸.

HALLUCINOGENS: Whilst plant-based hallucinogens (mescaline psilocybin) have been used for centuries, the first synthetic, and perhaps most infamous, LSD, was created in 1938. Ever since, several chemists have developed a series of analogue compounds that operate through the same primary mechanism of action. Examples of “novel agents” include Bromo-DragonFLY, AL-LAD, 5-MeO-Dalt, NBOME-series and 2C-series. User reports indicate that the effects are generally similar to classical hallucinogens. Similarly, both of them are generally associated with few physiological effects: pupil dilation, and to some degree mild and variable changes in heart rate and blood pressure, vasoconstriction, diaphoresis and hypersalivation and, depending on agent, nausea¹⁸.

Conclusions

In Portugal there has been hardly any clinical research into these new substances, sold only by Internet, as the Portuguese Government enacted a law making it illegal to sell psychoactive drugs, thus ending the smartshop business in the country as in 2013. This attitude from the Portuguese government has been praised by other countries. A Portuguese study estimating the prevalence and patterns of NPS’ use in two “at risk” sub-populations (adolescents/young adults users of illicit drugs) revealed higher rates of consumption within Addictive Behaviour Treatment Centres, as well as apparent underdiagnoses of those habits in the adolescent clinical setting. Some adolescents consume these drugs in school facilities, and the majority of users state that the consumption has a social characteristic (integration in friend groups, at weekends, parties and night clubs)²¹.

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