

Continuing Medical Education

# Substance-Use Disorders in Children and Adolescents

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## Summary

**Background:** The most common substance use disorders in childhood and adolescence have to do with alcohol and cannabis. These disorders begin as early as puberty, are often accompanied by other mental disorders, and, if untreated, very frequently persist into adulthood.

**Methods:** This review is based on pertinent publications retrieved by a selective search in PubMed on substance use disorders in children and adolescents.

**Results:** Substance use disorders are among the commonest mental disorders in childhood and adolescence. In Germany, approximately 10% of adolescents have tried cannabis at least once. The prognosis is negatively affected by individual (bio-)psychological traits, mental comorbidities, laws that facilitate consumption, socioeconomic disadvantage, consuming peers, and parental substance use disorders. A timely diagnosis, motivation by the pediatrician, and referral to specialized child and adolescent psychiatric services helps assure that those affected receive appropriate treatment, with the goal of abstinence from the substance as well as improvement in emotional regulation, affectivity, and attention. According to studies from the English-speaking countries and considering all treatment forms, treatment is completed by approximately 60% to 65% of children and adolescents; 20% to 40% of these patients are abstinent six months after the end of treatment. No studies of this type have been carried out to date in Germany.

**Conclusion:** As the results of treatment are generally poor, there is a major need for research on the treatment and care of children and adolescents with substance use disorders. In particular, the interfaces between outpatient and inpatient care need further improvement.

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Disorders involving the use of legal and illegal psychoactive substances (substance use disorders, SUD) begin in adolescence or young adulthood and are among the leading health risks for adolescents and young adults worldwide (1). The World Health Organization (WHO) estimates that more than 9% of the disability-adjusted life years (DALYs) lost to mental and neurological disorders are accounted for by psychoactive substance use in persons under age 24 (2). Harmful use by vulnerable persons often becomes established in early adolescence and can develop thereafter into a chronic use disorder with a high relapse potential and comorbidity.

## Learning objectives

This article is intended to familiarize the reader with:

- the explanatory models for the development and maintenance of addiction dynamics that are typical of adolescence, including their multiple biopsychosocial symptom and risk constellations;
- measures derived from these models for the diagnosis and treatment of children and adolescents with SUD, with due consideration of their stage of physiological and psychological development.

The term “harmful use” refers to consumption patterns that can damage health. In dependence, substance use

### Current situation

The number of hospitalizations of mostly male patients up to age 15 for cannabis-related disorders has more than quadrupled since 2002 and now stands at approximately 12,000 cases per year.

### Harmful use among the young

Harmful use by vulnerable persons often becomes established in early adolescence and can develop thereafter into a chronic use disorder with a high relapse potential and comorbidity.

takes precedence over other behaviors, with a strong, sometimes overpowering desire to use a psychotropic substance. Risky use is defined by certain threshold values for each situation in question.

### Methods

This review is based on a selective search in the PubMed database for meta-analyses, systematic reviews, and randomized controlled trials (RCT) that contain the search terms “alcohol AND adolescents” (7772 hits), “alcohol use disorder AND adolescents” (1028 hits), “substance AND adolescents” (4188 hits), “substance use disorder AND adolescents” (3538 hits), “cannabis use AND adolescents” (424 hits), or “cannabis use disorder AND adolescents” (274 hits), with special attention to the state of the evidence in Germany as well as to the treatment guidelines and position papers that have been issued by the relevant specialty societies (the German Society for Addiction Research and Addiction Therapy (*Deutsche Gesellschaft für Suchtforschung und Suchttherapie*, DG-Sucht) and the German Society for Child and Adolescent Psychiatry, Psychosomatics, and Psychotherapy (*Deutsche Gesellschaft für Kinder- und Jugendpsychiatrie, Psychosomatik und Psychotherapie*, DGKJP).

### General and clinical epidemiology

All psychoactive substances except tobacco are more commonly used by male than by female adolescents, with a sex ratio of 2:1 for the prevalence of use of some illicit drugs. There is almost no sex difference in tobacco smoking up to age 18 (3). Most adolescents have their first experiences with tobacco and alcohol between the ages of 13 and 15. The first use of cannabis is typically at age 14 or 15; persons under age 18 only rarely try other illicit substances (3, 4).

### Tobacco and alcohol

In 2001, 27.5% of adolescents smoked, at least occasionally. This figure has markedly declined since then, to 7.2% (3). Smoking is more common among vocational school pupils and apprentices than among academic-track high school pupils or university students. 20.9% of adolescents in Germany have smoked a water pipe at least once (20.9%). The lifetime prevalence of e-cigarette use among adolescents is 14.5% (electronic water pipes: 11.0%) and is especially high among male adolescents with a low level of education.

The use of alcohol has declined along with that of tobacco, yet alcohol remains by far the most commonly used psychoactive substance among adoles-

cents. More than one-third (35.5%) of adolescents surveyed report having used alcohol in the past 30 days, while 9% report having used it at least once per week over the past twelve months. 14.7% of adolescents reported having engaged in binge drinking on at least one day in past 30 days, and 3.2% on at least four days (3).

12.1% of 11- to 17-year-olds in Germany engage in risky alcohol use, which is characterized by a score of  $\geq 4$  for girls or  $\geq 5$  for boys on the Alcohol Use Disorder Identification Test-C [AUDIT-C]) (5). Its prevalence rises with age and is highest among 17-year-old girls, at 39.9%.

### Illegal drugs

Cannabis is the most commonly used illicit substance worldwide (e1). In Germany, about one in ten adolescents (10.4%) has tried cannabis (lifetime prevalence) (3). The use of other illicit drugs is significantly less common (1.7 % among 12- to 17-year-olds). Lifetime prevalences are highest for the use of ecstasy, amphetamine or psychoactive plants. The 12-month prevalence of illicit substance use is 8.3% (cannabis use, 8.1%). 4.0% of adolescents report current use (i.e., use in the past 30 days) (3).

### Clinical epidemiology

There are no current studies on the prevalence of SUD in Germany. A study in the United States (6) revealed an 11.4% lifetime prevalence and an 8.3% 12-month prevalence of SUD among 13- to 18-year-olds, where SUD was defined as in the DSM-IV (Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition). Another recent study from the United States (e2) revealed a 4.5% 12-month prevalence of SUD among 12- to 17-year-olds for 2019.

As for the utilization of addiction support services, the 2015/2016 Care Report (7), core data of the German Addiction Support Statistics (*Deutsche Suchthilfestatistik*) (e3), and reports by the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) (e4) have revealed the following trends for Germany:

- Diagnoses of SUD (item F1 in the International Classification of Diseases, ICD-10) among adolescents have become significantly more common since 2002.
- Alcohol-related disorders (ICD-10 item F10) are the most common cause of hospital treatment among children and adolescents. Each year in Germany, approximately 20,300 persons under age 20

### Prevalence

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### Alcohol consumption by adolescents

The use of alcohol has declined along with that of tobacco, yet alcohol remains by far the most commonly used psychoactive substance by adolescents. More than one-third of adolescents report having used alcohol in the past 30 days, while 9% report having used it at least once per week in the past year.

BOX 1

**Indicators of harmful substance use by children and adolescents (e30)**

- worsening performance in school and vocational training; truancy
- impaired concentration, restlessness
- changes in leisure interests
- changed patterns in choice of friends and types of relationship; withdrawal from social contacts (at home as well)
- mood swings and disturbed social behavior with impulsive outbursts, aggressiveness, and affect lability
- substance-induced psychopathological syndromes and physical disease
- connection to peers with harmful substance use, adoption of fashions from the drug set
- finding certain preparations of tobacco products, alcoholic drinks, and drugs (resins, plants, mushrooms, seeds, solutions, tablets, powders, printed blotting paper, etc.) and utensils for their use (cigarette paper, silver foil, candle, spoon, needles and syringes, tubing, glass pipe, etc.)
- evidence of self-neglect, poor personal hygiene
- evidence of dissocial behavior, crime committed in order to acquire drugs, prostitution
- harmful substance use by parents and peers

receive emergency inpatient treatment for acute alcohol intoxication (ICD-10: F10.0). This diagnosis has more than doubled in frequency since 2000.

- The number of hospitalizations for cannabis-related disorders (ICD-10 item F12; mostly male patients up to age 15) has more than quadrupled since 2002 and now stands at approximately 12,000 cases per year.
- The group of individuals with cannabis-related disorders is steadily becoming larger and younger, because younger persons are being initiated into risky forms of use.
- The treatment of cannabis-related disorders in 15– to 19-year-olds accounts for the largest share of outpatient and inpatient addiction services.

**Clinical features, course, and prognosis**  
**Substance use that is typical of adolescence, as opposed to substance-related disorders**

For 60–80% of adolescents, the regular use of licit and illicit substances is a temporary behavioral pattern limited to adolescence and early adulthood that increas-

ingly conflicts with changing social demands as the individual ages, and then ceases (e5). Terry Moffitt (8) has coined the descriptive term “adolescence-limited” for this developmental course, which is within the norm from the point of view of developmental psychology; only a minority of persons go on to develop a long-term addictive disorder, presumably because of further risk factors (e6). These so-called “life course persistents” have trouble coping with stress in early childhood, worsening over the course of further development and ultimately presenting as a disorder (e7). The causation of addictive disorders is multifactorial, with genetically based vulnerabilities interacting with environmental risk factors to determine the development of SUD. These vulnerabilities and risk factors include high sensitivity to reward-type environmental stimuli, low inhibitory control, temperament and impulsiveness, early emotional trauma, and an unfavorable family environment. A disorder develops when the “stress load” is high, depending on the degree of vulnerability: the more vulnerable the individual, the less “stress” is needed to trigger the disorder (4, e8).

Children and adolescents with SUD are clinically heterogeneous. Signs that are an initial, nonspecific—but sometimes very clear—warning of harmful use are listed in *Box 1*.

**Consequences of substance use and substance-related disorders**

Substance use can markedly damage health, lessen life expectancy, and cause social problems depending on the type, duration, and quantity of the substances used, comorbid mental disorders (if any), and accompanying problematic psychosocial constellations. Approximately one-third of traffic fatalities among 15– to 20-year-olds are related to substance use (9). Substance use significantly increases the risk of being either a perpetrator or a victim of an act of violence. Girls who engage in binge drinking have a threefold increased risk of becoming a victim of an unwanted sexual act (10). Substance use by persons who also have a depressive disorder or a critical life event is associated with attempted and completed suicide. Excessive use often leads to dropping out of school or vocational training. The psychosocial problems of persons who engage in harmful use tend to worsen because of a tendency to engage socially mainly with other persons of the same kind (11). Such persons may also become increasingly likely to commit crimes while intoxicated or crimes with the purpose of acquiring drugs (12). SUD in children cause major problems for their

**Life course persistents**

So-called life course persistents have trouble coping with stress in early childhood, worsening over the course of further development and ultimately presenting as a disorder.

**The multifactorial causation of addictive disorders**

The causation of addictive disorders is multifactorial, with genetically based vulnerabilities interacting with environmental risk factors to determine the development of SUD.

families and social assistance systems. Persons who use psychoactive substances are also more likely to act impulsively (13). The health risks associated with substance use vary depending on the developmental state. Along with the harmful effects of prenatal exposure to psychotropic substances (e9), studies have revealed persistent (neuro-)pathological effects caused by (e.g.) alcohol use in adolescence. The chronic consumption of alcohol, or its use in large quantities per episode of consumption (binge drinking), harms cortical and sub-cortical brain regions much more severely and lastingly in adolescents than in adults (evidence level 1b) (14).

Approximately 9% of cannabis users develop dependence over a lifetime (e10); the rate is higher (17%) among those who began using cannabis in adolescence, and higher still (25–50%) among those who used cannabinoids daily in adolescence (15). Experimental studies suggest that the epigenetic effects of cannabinoids can impair myelination of the pubertal brain (16). Intense cannabis use in adolescence impairs memory, learning, recall, attention, problem solving, reasoning ability, and intelligence (evidence levels 1b-4) (17). These findings accord with the documented age-related structural and functional changes in the cerebral gray and white matter of cannabis users (evidence level 1b) (18, e11). In vulnerable individuals, there is a dose-dependent association with depressive disorders (odds ratio [OR]: 1.2–1.6; evidence level 4) (e12), suicidality (OR: 0.64–4.55; evidence level 4) (e12), bipolar disorder (OR: 2.97; evidence level 1a) (e13), anxiety disorders (OR: 3.2; evidence level 2) (e14), and the concomitant harmful use of alcohol and other illicit drugs (19, e15, e16). Cannabis use can trigger psychosis in vulnerable individuals and significantly worsen the course of schizophrenic psychosis (20). The high tetrahydrocannabinol (THC) content in cannabis products plays a major pathogenetic role (21). Adolescents who use cannabis intensively are more likely to drop out of school (OR: 1.2–7.9; evidence level 2) (e17) and have worse educational outcomes than nonusers (evidence level 1a) (22, e18).

### Predicting the course of substance-related disorders

Early-onset, markedly increasing use that is reinforced by peers is the characteristic situation in which a substance-use disorder is likely to take an unfavorable course. The following are also unfavorable prognostic factors (23, 24, e6, e19):

- legal conditions that facilitate substance availability and use

### Harmful effect on memory performance

Intense cannabis use in adolescence impairs memory, learning, recall, attention, problem solving, reasoning ability, and intelligence

### BOX 2

#### RAFFT for drug use (e32)

- Do you ever use illicit drugs to **relax** or feel better about yourself?
- Do you ever use illicit drugs to fit in?
- Does anyone in your circle of friends use illegal drugs regularly (at least once a week)?
- Do you ever use illicit drugs while you are by yourself, or **alone**?
- Does anyone in your family have a problem with illegal drugs?
- Have you ever gotten into **trouble** because you were using illicit drugs (for example, bad grades, trouble with the law or your parents)?

RAFFT is an acronym derived from words that indicate various contexts of use: "relax, alone, friends, family, trouble." If an adolescent aged 12 to 18 answers two or more of these questions affirmatively, a substance-use disorder may be present. Analogous questions can be asked about alcohol and tobacco use.

- reward-associated personality traits (impulsivity, curiosity), early behavioral problems and comorbid mental disorders due to underdeveloped self-regulation skills
- childhood neglect and maltreatment
- socioeconomic disadvantage, low educational attainment, problems at school, and deprived social environment
- association with consuming peers
- parental SUD and mental disorders, problematic parent-child relationships

In contrast, the following features (when marked) improve the prognosis of SUD in adolescents:

- fear of negative effects of substance use
- Self-confidence and psychosocial skills
- absence of comorbid mental disorders
- abstinent peers
- socioemotional support from parents.

Young substance users may present to a physician because of conflicts with parents, teachers, or vocational trainers resulting from substance use. Other reasons include psychological problems (depressive symptoms), performance problems, negative experiences during intoxication (panic

### Cannabis consumption and dependence over a lifetime

Approximately 9% of cannabis users develop dependence over a lifetime; the rate is higher (17%) among those who began using cannabis in adolescence, and higher still (25–50%) among those who used cannabinoids daily in adolescence

BOX 3

**Diagnostically relevant indicators of a substance-use disorder in childhood or adolescence (e34)**

- expected positive consequences (gain of status, problem reduction) and experienced negative consequences (withdrawal symptoms, craving) of substance use; early tobacco use
- worsening school performance, social withdrawal, dropping out of school
- substance use and delinquency among peers
- dissocial behavior (lying to adults, stealing from parents), delinquency
- psychological traumatization, experience of abuse (including witnessing abuse), early sexual contact, early pregnancy
- comorbid mental disorder, e.g.: social behavior disorder, attention deficit disorder, affective disorder, anxiety disorder, suicidality
- family history: substance use by parents and siblings, dissocial behavior in the family, impaired parent-child relationships, mental illness of parents
- socioeconomic disadvantage, belonging to a marginalized groups, deprived living environment and high crime rate

attacks, mood swings, horror trips, impulse breakthroughs, overdose), and substance-induced psychiatric syndromes (severe anxiety, affective and psychotic disorders). Treatment may also be sought because of orders imposed by family and criminal courts or because of the bodily harm and long-term damage resulting from harmful use.

**Comorbid mental disorders**

Clinical and epidemiologic studies show a significant overlap between SUD and other adolescent psychiatric disorders (25); these disorders play an important role in treatment planning (26). Among persons with SUD, psychiatric comorbidity is far more common in child and adolescent patients (76%) than in older ones (>18 years: 23.4%) (27).

The most common psychiatric comorbidities are conduct disorders (28–62%, depending on the study) with and without hyperkinetic disorders, followed by depressive, anxiety, and impulse control disorders (16–61%). Further comorbidities include social phobic disorders, eating disorders, borderline personality disorders, substance-induced psychoses (due to cannabis, ecstasy, amphetamines, cocaine, D-lysergic acid diethylamide [LSD]), and schizophrenic psy-

**The prognosis for the course of substance-use disorders**

Aside from individual factors, the prognosis is worsened by legal conditions that facilitate substance use, by substance availability, and by socioeconomic disadvantage, consuming peers, parental substance-use disorders, and problems in the family.

choses (25, e20). Typical comorbidities among boys are conduct disorders and combined conduct and emotional disorders, attention deficit disorder with and without hyperactivity (AD[H]S), and personality disorders (antisocial and narcissistic personality disorders). Among girls, the most common comorbidities are depressive disorders post-traumatic disorders, disturbances of emotional development, and borderline personality disorders (e21).

On the one hand, studies have shown a marked aggravating influence of SUD on the course of psychiatric disorders in childhood and adolescence. On the other hand, it can be shown that mental disorders often precede substance use (25) and thus increase the risk for SUD, e.g., because of self-medication, or negatively affect its course, e.g., through the discontinuation of SUD treatment programs.

**Diagnostic evaluation**

For mental disorders, including SUD, the International Classification of Diseases (ICD-10) of the World Health Organization (WHO) is essential. Its 11th edition, issued last year, differs substantially from the prior edition: categories have been expanded, diagnostic criteria modified, and new diagnoses introduced (28) (eTable 1).

Adolescents generally report their own substance use reliably if they trust the person asking the questions. These self-reports are supplemented by information from parents and others. There are suitable procedures for the taking of a structured drug history (eTable 2). A urine toxicology screen is part of the standard diagnostic evaluation.

No German-language structured interview instruments exist for the diagnosis of SUD. The American RAFFT (“relax, alone, friends, family, trouble”), which is normed for 12- to 18-year-olds, is helpful for screening; it can indicate risky consumption patterns and is recommended for use by pediatricians and family doctors (Box 2). Further diagnostically relevant indicators of substance-related disorders in childhood and adolescence are given in Box 3.

**Treatment**

The following information on the treatment of adolescents with SUD are based on the treatment guidelines of the Association of Scientific Medical Societies in Germany (AWMF) (e22-e24) and on specialty society recommendations on treatment and quality standards for acute and post-acute treatment and medical rehabilitation (29–32). All of the recommendations presented

**Comorbid psychiatric disorders**

The most common psychiatric comorbidities are conduct disorders with and without hyperkinetic disorders, followed by depressive, anxiety, and impulse control disorders.

for specialized therapies are based on expert consensus, with the exception of psychotherapeutic approaches, for which there is evidence of moderate to very good quality (*Boxes 4 and 5*).

### Disorder- and age-specific treatment

The proper treatment of a child or adolescent with a substance use disorder depends on the particular disorder present and on the age of the patient. The specific effects of psychoactive substance use must be considered as well as the special developmental and psychopathological aspects of childhood and adolescence. Treatment concepts that are appropriate for addicted adults may not be appropriate for children and adolescents. The following special considerations apply:

- It is much more common for the treatment of adolescent patients to be requested by family members than by the patients themselves. Pediatricians and family doctors are often the relatives' first point of contact.
- Motivational interviewing approaches are very helpful for promoting insight and readiness to change (e25).
- When the treatment begins, the families of children and adolescents with SUD are often already suffering from persistent conflict situations, relationship problems, instability, and deficient care. Nevertheless, the children still need a great deal of parental attention while they are being treated.
- Children and adolescents with SUD differ from adult patients in their need for pedagogical support and the need to make progress in their education and/or vocational training.
- Adolescents become socialized mainly by their coeval peers, whose behavior markedly affects these patients' utilization of treatment.

In Germany, children and adolescents are now mainly treated for SUD in specialized outpatient clinics and departments of child and adolescent psychiatry and psychotherapy:

- outpatient counseling and treatment services,
- day clinic treatment (very rarely),
- inpatient treatment.

Indicators for the choice of outpatient treatment and partial or total in-hospital treatment are summarized in *eBox 1*.

The treatment has several phases (29):

- qualified withdrawal treatment (in child and adolescent psychiatry clinics specializing in the treatment of addiction: [www.dgkjp.de](http://www.dgkjp.de))

- continuing treatment of comorbid mental disorders (in clinics for child and adolescent psychiatry)
- continuing medical rehabilitation (withdrawal and long-term therapy in medical institutions)
- professional support of education and vocational training
- support in the structuring of everyday life, if necessary also as inpatient aftercare in youth welfare homes.

It is estimated (29, 31, 32) (*eBox 2*) that children and adolescents with SUD are a widely underserved population. Many regions lack adequate services with respect to

- youth-specific addiction counseling and care facilities,
- beds for qualified withdrawal treatment for adolescents,
- medical rehabilitation facilities.

### Qualified withdrawal treatment, post-acute treatment, and medical rehabilitation

The fundamental goal of the treatment of children and adolescents with SUD is abstinence from addictive substances. Important intermediate goals can include lessening substance use, preventing relapses, and improving functional levels (30, 33). The treatment of children and adolescents with SUD is highly structured and is intended to promote patient insight through a multimodal, interdisciplinary approach. The therapeutic spectrum ranges from psychotherapy and environmental measures to as somatic and pharmacological treatments (summarized in *Box 4*, with further information on the efficacy of individual treatments in *Box 5*). In qualified withdrawal treatment and post-acute treatment, psychotherapeutic approaches such as individual and group therapy of various types, family therapy, relapse prevention and social skills training are combined with ward-integrated specialized therapies (movement, body, occupational and music therapy, acupuncture, relaxation methods). Patients often need concomitant psychoactive medication to stabilize their affect and impulse control. Further components of child and adolescent psychiatric care for these patients include individualized pedagogical support, socialization in the group, and educational or pre-vocational measures.

Qualified withdrawal treatment takes from four to twelve weeks, depending on the individual situation, indication, substance abuse, follow-up measures, and course of treatment. The need for, and course of, further treatment of comorbid mental disorders and consolidation of abstinence varies from patient to

### Diagnostic evaluation

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### Disorder- and age-specific treatment

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BOX 4

Elements of the treatment of addiction in children and adolescents (29, 30, 32, e22–e24, e36)

● **Entryphase**

- contact phase (pediatricians and family doctors): trusting atmosphere (C); screening („relax, alone, friends, family, trouble“, RAFFT); drug history, medical counseling (C); motivational interviewing (A); brief interventions (B) to promote disease insight / motivation to change, if necessary referral to an addiction center of a clinic for child and adolescent psychiatry and psychotherapy (CAPP)
- outpatient detoxification; pharmacotherapy, if necessary, to alleviate withdrawal symptoms (C)

● **inpatient treatment**

- Inpatient qualified withdrawal treatment (QWT) in a CAPP addiction center, in the absence of a supportive social environment or if previous attempts to stop consumption have failed (B); pharmacotherapy, if necessary, to alleviate withdrawal symptoms (C), motivation to seek further treatment
- further inpatient treatment of comorbid mental disorders after QWT in a CAPP addiction center (C): learning self-control techniques (cognitive behavioral therapy) in groups (A); involvement of family members (A); multidimensional family therapy/integrated family and cognitive behavioral therapy (A); contingency management (C); psychoeducation (C); social skills training (C); relapse prevention (C); educational support (C); acupuncture (C); psychopharmacological treatment of comorbid mental disorders (C); hospital school (C); sports, music, exercise, and occupational therapy (C)

● **Aftercare**

- medical rehabilitation (SGB V): integration into school, work, occupation and society through measures of psychosocial (C) and educational-occupational rehabilitation (C); maintenance of abstinence, remediation of physical/mental disorders, stabilization of social skills (C)
- further support by youth welfare authorities (§ 35a SGB VIII): promotion of participation (in school and in treatment); outpatient, partial inpatient, and inpatient treatment for a longer period of time
- further outpatient treatment in specialized outpatient clinics, CAPP practices, child and adolescent psychotherapy, sociotherapy (C)
- if necessary, transfer to adult care system (transition)

Evidence level (A) for meta-analyses, systematic reviews, randomized controlled trials; evidence level (B) for controlled clinical trials, case-control/cohort studies; evidence level (C) for observational studies, expert opinions

patient; usually, another three months of post-acute inpatient treatment are required, or more if necessary (e24, 31). Medical rehabilitation as a further treatment for addicted adolescents is only rarely offered in Germany (32). Further ambulatory treatment after a period of inpatient treatment is provided by child and adolescent psychiatrists and psychotherapists, in tandem with various measures provided by the youth welfare, family assistance, and occupational integration services (e25).

**Treatment outcomes and prognosis**

The outcome of treatment of children and adolescents with substance-related disorders is essentially determined by three parameters:

- staying in treatment until its regular, planned end (retention rate);

- achievement of the treatment goals (abstinence, improvement of mental comorbidities);
- relapse rate.

Regular treatment completion is considered the best predictor of long-term success.

Studies in the English-speaking countries have documented retention rates of 60% to 65% for children and adolescents undergoing any type of treatment (e26). In outpatient treatment, nearly 60% of children and adolescents are abstinent upon treatment completion. 20–40% of patients who complete the treatment do not have a diagnosis of SUD six months later (34, e27, e28). No corresponding study findings exist for Germany.

The risk of relapse is highest in the first six months after treatment completion (35). In adolescents, the risk of relapse is typically much higher when peers (especially former friends from the drug scene) exert

**SUD are now mainly treated in specialized outpatient clinics and inpatient wards for child and adolescent psychiatry and psychotherapy:**

- outpatient counseling and treatment
- day-clinic treatment (very rare)
- inpatient treatment

**The treatment has several phases**

- qualified withdrawal treatment
- continuing treatment in child/adolescent psychiatry
- continuing medical rehabilitation
- professional support of education and vocational training
- support in the structuring of everyday life

BOX 5

**The efficacy of treatment approaches for children and adolescents with substance-use disorders (SUD)**

- The following outpatient treatments of SUD in childhood and adolescence are effective (evidence level 1a-2b) (e27, e28, e31):
  - family-based therapies (FBT): brief strategic family therapy (BSFT), functional family therapy (FFT), multidimensional family therapy (MDFT), multisystemic therapy (MST)
  - FBT in combination with contingency management (CM)
  - cognitive behavioral therapy (CBT) in individual (E) and group settings
  - CBT in combination with motivational interviewing (MI) or motivational enhancement therapy, MET/CBT, or MET/CM in group settings
- MI / motivational enhancement therapy (MET) as a single approach is supported by evidence of no more than moderate quality; CM has not been adequately tested as a single approach
- Much more research is needed for multidimensional treatments, and comparative studies are lacking for the following interventions: psychoeducation, individual treatment goal agreements, school-based instruction, case management, self-help, aftercare, peer approaches, and mindfulness-based therapies (e27)
- For adolescents with SUD and comorbid mental disorders, or adolescents with severe SUD, (a) longer treatment duration, (b) more intense treatment, and (c) incorporation of family-based approaches lead to better outcomes (evidence level 2a-4), and approaches (behavioral/pharmacological) to improve cognitive behavioral control and emotion regulation are promising. Older adolescents benefit more than younger ones from cognitive-based procedures (evidence level 3-4) (e31).
- Treatment dropouts are more likely to have severe behavioral problems. Patients with regular therapy completion are more likely to have comorbid depressive disorders/adjustment disorders and are also more likely to receive psychopharmacological treatment (evidence level 2b) (e39).
- On the matter of facility-related moderators of treatment success, the following facility characteristics were found to favor treatment success (evidence level 2b) (e38):
  - higher facility caseload
  - higher facility budget
  - larger number of staff members with at least two years of specialized work experience
  - provision of schooling and of vocational orientation measures
  - provision of group therapy, crisis intervention, occupational therapy, and music and art therapy
  - stimulation of leisure activities
  - set of rules for behavior

social pressure; when substances are readily available or are used by parents, siblings, or peers; when there are persistent comorbid mental disorders; or when the patient does not attend an aftercare program (35, 36).

**Overview**

In Germany, a high standard of treatment for children and adolescents with SUD is maintained by the provision of qualified inpatient withdrawal and post-acute treatment in accordance with the relevant guidelines. Problems situated at the interfaces between outpatient and inpatient care still need to be addressed through improved fitting between care structures.

There is a major need for further research and development on the prevention (e29) and treatment of

SUD in this age group, and on the provision of care, with the ultimate goal of improving intervention outcomes, which are still unsatisfactory in general (eBox 3). The new German Centers for Child and Adolescent Health (*Deutsche Zentren für Kinder- und Jugendgesundheit*, DZKJ) will play a central role in this effort (37).

**Conflict of interest statement**

Prof. Thomasius is Chairman of the Joint Commission on Addiction of the child and adolescent psychiatric professional societies and associations in Germany (DGKJP, BAG KJPP, BKJPP). He is Past President of the German Society for Addiction Research and Addiction Therapy (DG-Sucht). He is also one of the main authors of the AWMF S3 guidelines on alcohol-related disorders, tobacco-related disorders and medication-related disorders, as well as a leading member of the Task Force on Transition Psychiatry.

The remaining authors state that they have no conflict of interest.

**The goal of SUD treatment**

The fundamental goal of the treatment of children and adolescents with SUD is abstinence from addictive substances. Important intermediate goals can include lessening substance use, preventing relapses, and improving functional levels.

**Qualified withdrawal treatment**

Qualified withdrawal treatment should be followed by further child/adolescent psychiatric and psychotherapeutic treatment of comorbid mental disorders



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**Treatment success**

Regular completion of treatment and suitable aftercare are the main determinants of treatment success.

**Overview**

In Germany, a high standard of treatment for children and adolescents with SUD is maintained by the provision of qualified inpatient withdrawal and post-acute treatment in accordance with the relevant guidelines.

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#### ► Supplementary material

eReferences, eTable, Case Illustration, eBoxes:  
[www.aerzteblatt-international.de/m2022.0122](http://www.aerzteblatt-international.de/m2022.0122)

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Only one answer is possible per question. Please select the answer that is most appropriate.

**Question 1**

**Which of the following substances is used to a similar extent by male and female adolescents?**

- a) cannabis
- b) ecstasy
- c) alcohol
- d) tobacco
- e) opioids

**Question 2**

**Which of the following substances do adolescents most commonly use?**

- a) cannabis
- b) tobacco
- c) alcohol
- d) sniffed substances
- e) benzodiazepines

**Question 3**

**The consumption of what substance is the most common cause of presentation of a 15- to 19-year-old to an addiction help center?**

- a) heroin
- b) alcohol
- c) cigarettes
- d) cannabis
- e) ecstasy

**Question 4**

**Which of the following is a vulnerability or risk factor for addiction?**

- a) diminished reward sensitivity
- b) early trauma
- c) low sensation-seeking (curiosity)
- d) low impulsivity
- e) high inhibitory control

**Question 5**

**Approximately what percentage of traffic fatalities among 15- to 20-year-olds are associated with substance use?**

- a) 10%
- b) 20%
- c) 30%
- d) 40%
- e) 50%

**Question 6**

**What percentage of persons who start using cannabis in their adolescence develop cannabis dependence (regardless of the frequency of consumption)?**

- a) 5%
- b) 9%
- c) 13%
- d) 17%
- e) 21%

**Question 7**

**Which of the following is an important therapeutic element of inpatient treatment (evidence level A)?**

- a) ergotherapy
- b) acupuncture
- c) relapse prevention
- d) cognitive behavioral therapy
- e) educational assistance

**Question 8**

**Which of the following is an important general consideration in the treatment of children and adolescents with substance-use disorders?**

- a) The available evidence supports the direct transfer of treatment concepts and settings from adult psychiatry to affected children and adolescents.
- b) The fundamental goal of treatment is to enable controlled consumption.
- c) Involving the family in the treatment has a high priority.
- d) Pedagogical support should be avoided in the therapeutic setting because it may be demotivating.
- e) If inpatient treatment is indicated, a maximum duration of four weeks should be planned.

**Question 9**

**Which of the following mental disorders is most commonly diagnosed as a comorbidity in children and adolescents with substance-use disorders?**

- a) ecstasy-induced psychosis
- b) conduct disorder
- c) bulimia nervosa
- d) bipolar disorder
- e) claustrophobia

**Question 10**

**How has the number of fully inpatient treatments for cannabis-related disorders changed since 2002?**

- a) It has dropped by 30%.
- b) It has not changed at all.
- c) It has increased to a small extent.
- d) It has almost doubled.
- e) It has more than quadrupled.

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## Supplementary material to:

## Substance-Use Disorders in Children and Adolescents

by Rainer Thomasius, Kerstin Paschke, and Nicolas Arnaud

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## eBOX 1

**Indicators for the choice of outpatient versus inpatient treatment (e35):**

- **Indicators for choosing outpatient treatment:**
  - good social integration (structured daily activities, social relationships are not mainly defined by substance use)
  - ability to come to an agreement on treatment; willingness to cooperate
  - ability to achieve abstinence
  - no more than a few previous treatments
  - no more than mild comorbid mental disorders
  - relapse after previous treatment
  
- **Indicators for the choice of inpatient treatment:**
  - heavy and regular substance use
  - previous failed outpatient withdrawal treatments
  - pronounced comorbid mental disorders
  - somatic disorders requiring inpatient treatment
  - dysfunctional family or social environment
  - loss of daily structure
  - acute danger to self or others

eBOX 2

**Care structure for children and adolescents with substance-use disorders in Germany**

Approximately 220 beds are now available in Germany for the qualified withdrawal treatment and post-acute treatment of children and adolescents with substance-related disorders (SUD). These are located in 20 specialized wards in clinics for child and adolescent psychiatry and psychotherapy. Approximately 40 further beds are now available for medical rehabilitation in two wards at clinics for child and adolescent psychiatry and psychotherapy ([www.dgkjp.de](http://www.dgkjp.de)). In contrast, there are approximately 6,000 beds for the qualified withdrawal treatment of adults in psychiatric hospitals and departments, along with approximately 13,000 beds in some 180 facilities for inpatient medical rehabilitation in specialized clinics, therapy facilities, and hospital wards (e41).

The following recommendations about necessary changes in the care structure for children and adolescents with SUD in Germany are contained in the current treatment guideline on alcohol-related disorders issued by the Association of the Scientific Medical Societies in Germany (AWMF) (e40), the Task Force on Transition Psychiatry of the German Society for Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy (DGKJP), and the German Society for Psychiatry and Psychotherapy, Psychosomatics and Neurology (DGPPN) (29, e40):

In child and adolescent psychiatry and psychotherapy as well as in adult psychiatry, there must be an expansion of special networked outpatient, (partially and entirely) inpatient, and rehabilitative care structures for adolescents with either SUD or non-substance-related addictive disorders, such as pathological gambling and Internet/media-related disorders:

- effective outpatient preparation for inpatient treatment
- close networking between the medical care system and the youth welfare and addiction aid services
- seamless transitions into and out of inpatient care
- follow-up treatment for adolescents with severely impaired psychosocial development after the completion of full and partial inpatient psychiatric, psychotherapeutic, and addiction-specific treatment
- youth welfare facilities for longer-term pedagogical assistance (and treatment of learning disorders, if necessary) with the qualified provision of addiction-specific measures
- unambiguous rules about who is to bear the costs

Medical rehabilitation is an extension of the treatment offerings for addicted adolescents. Medical rehabilitation for adolescents

- must be extended to minors and must not compete with qualified withdrawal treatment or acute treatment of the underlying disorder
- is not the same as, nor can it replace, inpatient psychiatric treatment
- is predicated on the prior adequate treatment of the acute dependence disorder in four to twelve weeks of qualified withdrawal treatment, as well as on the prior treatment of acute mental comorbidities
- is explicitly not recommended in addiction support facilities for adults.

## eBOX 3

**Research desiderata on treatment approaches for children and adolescents with substance-use disorders (SUD)**

According to studies from the United States, approximately 90% of adolescents meeting the diagnostic criteria for SUD are not adequately treated (e33, e37). There is thus a need for the further development and evaluation of stepped-care approaches, ranging, in sequence, from (a) brief instructions and (b) brief interventions, in the form of motivational interviewing and motivational enhancement therapy (MI/MET), to (c) interventions for the purpose of referral to more intensive forms of treatment. Stepped-care approaches require screening, diagnostic evaluation, treatment planning, and treatment initiation by pediatricians, family physicians, and other services in schools, youth services, family support, and substance abuse counseling. The available evidence on the efficacy of screening combined with brief interventions is inconsistent, however, and there have not been any studies to date on the efficacy of recommendations for referral to more intensive forms of treatment (e27, e31).

Among the outpatient multidimensional treatment approaches that address comorbid mental disorders accompanying SUD, those that are particularly focused on trauma and risky sexual behavior have been tested and evaluated, in some cases using a sequential approach (e27). Behavioral interventions for SUD and comorbid depressive disorders or attention deficit disorders have been tested in combination with pharmacotherapy. Much more research is needed with regard to multidimensional treatments, which have not yet been tested in comparative trials. This is particularly true for multidimensional approaches that include the following interventions: school-based instruction, case management, self-help, follow-up treatment after acute and post-acute treatment, peer-based approaches, and mindfulness-based therapies (e27).

Other promising interventions that have only been partially evaluated to date include psychoeducation, goal-setting interventions, involvement of family members, and individualized goal-setting agreements with the adolescents at the beginning of treatment, including individualized treatment planning.

Future studies will have to examine the patient-related determinants of treatment success, e.g., the influence of executive functions, social networks in the patient's environment, or comorbid mental disorders, for different subgroups of adolescents with SUD, such as those defined by age, sex, educational level, or immigrant background. This will also scientifically address the question of which patients are best suited by which forms of treatment, as we move toward individualized treatment approaches for children and adolescents with SUD (e31). The same future studies should also consider the potential facility-related determinants of treatment outcome.



eTABLE 1

**Diagnostic criteria for substance dependence according to ICD-11 and ICD-10**

	ICD-11: Substance dependence (6C4x.2)	ICD-10: Dependence syndrome (F1x.2)
	A <b>disorder of the regulation of substance use</b> arising from the repeated or continuous use of a substance. The characteristic feature is a <b>strong internal drive</b> to use a substance or substance class.	A cluster of physiological, behavioral, and cognitive phenomena in which the use of the substance takes on a much higher priority for a given individual than other behaviors that once had greater value.
1	<b>Impaired control over substance use</b> —in terms of the onset, level, circumstances, or termination of use, and often, but not necessarily, accompanied by a subjective sensation of urge or craving to use the substance.	Difficulties in controlling substance-taking behavior in terms of its onset, termination, or levels of use (loss of control). A strong desire or sense of compulsion to take the psychoactive substance (craving or compulsion).
2	Substance use becomes an <b>increasing priority</b> in life such that its use takes precedence over other interests or enjoyments, daily activities, responsibilities, or health or personal care. It takes an increasingly central role in the person's life and relegates other areas of life to the periphery. Substance use often continues despite the occurrence of problems.	Progressive neglect of alternative pleasures and responsibilities because of psychoactive substance use. Persisting with substance use despite clear evidence of overtly harmful consequences.
3	<b>Physiological features</b> (indicative of neuroadaptation to the substance) as manifested by (i) tolerance, (ii) withdrawal symptoms following cessation or reduction in use of that substance, or (iii) repeated use of the substance (or pharmacologically similar substance) to prevent or alleviate withdrawal symptoms. Withdrawal symptoms must be characteristic for the withdrawal syndrome for that substance and must not simply reflect a hangover effect.	Demonstration of tolerance. A physiological withdrawal state when substance use has ceased or been reduced.
	The features are present over a period of at least twelve months, or else continuously (every day or nearly every day) over a period of at least one month.	For the diagnosis to be made, three or more criteria must have been present simultaneously during the preceding year.

ICD, International Classification of Diseases

ICD-11: [icd.who.int/browse11/l-m/en#/http%3a%2f%2fid.who.int%2fcd%2fentent%2f688207252](http://icd.who.int/browse11/l-m/en#/http%3a%2f%2fid.who.int%2fcd%2fentent%2f688207252)

ICD-10 (ICD-10-GM: psychische und Verhaltensstörungen durch psychotrope Substanzen): [www.dimdi.de/static/de/klassifikationen/icd/icd-10-gm/kode-suche/htmlgm2020/block-f10-f19.htm](http://www.dimdi.de/static/de/klassifikationen/icd/icd-10-gm/kode-suche/htmlgm2020/block-f10-f19.htm)

eTABLE 2

**Substance use history form**

**Last name, first name, date of birth:**

Substance	Age at first use (in years)	Current dose	Route of administration (1 – oral, 2 – nasal, 3 – inhaled, 4 – intravenous)	Phases of excessive use (months, daily dose)	Regular use in the past 6 months	Tried to quit? (Yes/No)
Nicotine						
Alcohol						
Cannabis						
Synthetic cannabinoids						
Amphetamine						
Ecstasy						
Crystal						
Bath salts						
Cocaine						
Crack						
D-lysergic acid diethylamide (LSD)						
Psilocybin						
Mescaline						
Liquid ecstasy/ gamma hydroxybutyrate (GHB)						
Ketamine						
Sniffing substances (deodorant, lighter gas, laughing gas)						
Benzodiazepines						
Prescription drugs						
Heroin						
Methadone						
L-polamidone						
Buprenorphine						

## CASE ILLUSTRATION

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### History

A 17-year-old boy presents to the drug outpatient clinic for adolescents, young adults and their families at the Universitätsklinikum Hamburg-Eppendorf (UKE) on the advice of his psychotherapist. He reports having started psychotherapy six months ago after the sudden death of his father. He suffers from severe mood swings, passive suicidal thoughts, and avolition. He has also been having trouble in school for the past year and a half, with difficulties of concentration and motivation. He is now in the twelfth grade at a Waldorf (Rudolf Steiner) school. His academic performance has markedly deteriorated. He has skipped school with increasing frequency over the past year.

For the past year, he has been using benzodiazepines and cannabis daily, and has sporadically used opioids alone and with friends. This enables him to “numb” himself in the short term. However, he is now increasingly experiencing adverse consequences of his consumption, including frequent arguments at home. He drank alcohol for the first time at age 13; since then, he has drunk alcohol at irregular intervals, occasionally hard liquor leading to drunkenness. He first tried cannabis at 14 and has gradually increased his consumption since then. About a year ago, he tried methylenedioxyamphetamine (MDMA), cocaine, D-lysergic acid diethylamide (LSD), and psilocybin mushrooms. At the same time, he began taking tramadol, tilidine, codeine, clonazepam, alprazolam, and “sleeping pills” for severe lovesickness. After his father died, his consumption intensified.

He lives with his mother and his sister, who is one year younger. His parents had separated two years ago amid massive disputes. Six months before his father’s death, he had broken off contact with him out of frustration with his irregular contact.

The patient desires inpatient treatment on the UKE adolescent addiction ward. Outpatient planning is initiated.

### Clinical examination

On admission to the adolescent addiction center, psychopathological examination an alert and fully oriented young man who is friendly and sympathetic. With respect to his psychomotor state, he seems tense and restless. His mood appears to be dysthymic, with a lack of emotional reactivity, but preserved emotional flexibility. He reports fearing that something could happen to his mother, against the background of his mother’s being under marked psychological stress and his own worries about the future. He denies suffering from obsessions or compulsions. His formal thought is rambling, but otherwise unremarkable. No disturbances of thought content, no evidence of delusions or hallucinations. No somatic complaints other than occasional headaches. He tends to brood, particularly in the evening, and has trouble falling asleep, sometimes with latencies of up to one hour. His appetite is normal. He denies self-injurious behavior. He reports having suicidal thoughts without concrete plans for action several times a week, but has never attempted suicide. He last used benzodiazepines three days before admission (having gradually reduced the dose on his own over the past few weeks; he previously took 5–6 tablets daily in different dosages for several months). He last used cannabis the day before admission and generally takes 3–4 g daily. He last used opioids about 2.5 weeks ago (previously sporadic use).

The clinical-neurological examination reveals an athletic, age-appropriate adolescent with unremarkable findings. Height 185 cm (75th percentile), weight 71 kg (50th percentile), body mass index (BMI) 20.7 kg/m<sup>2</sup> (25th–50th percentile). Vital signs: Blood pressure 130/75 mm Hg, pulse 60/min.

### Ancillary and psychological testing

- Laboratory findings: complete blood count, hepatic, renal, and thyroid function tests within normal limits.
- Urine toxicology for barbiturates, benzodiazepines, cannabinoids, cocaine metabolite, ecstasy/amphetamines, ethyl glucuronide: benzodiazepines 1244 ng/mL (reference < 200); cannabinoids > 75 ng/mL (reference < 20).
- Electrocardiogram: age-appropriate normal findings.
- Questionnaire diagnostics: self-reports and external reports (completed by the patient's mother) revealed abnormalities regarding emotional and behavioral problems, oppositional-aggressive behavior, depressiveness, generalized anxiety, concentration, and impulsivity (Strengths and Difficulties Questionnaire [SDQ], Diagnostic System of Mental Disorders for Children and Adolescents [DISYPS], attention-deficit/hyperactivity disorder [ADHD], conduct disorder [SSV], depressive disorder [DES]).
- The neuropsychological test battery for attention revealed below-average reaction times and a slow work pace.
- School reports repeatedly described easy distractibility, motor restlessness, sloppy work, and poor organization.
- Detailed intelligence testing (WAIS-IV) revealed a heterogeneous performance profile with severely below-average processing speed and working memory performance that was worse than his language comprehension and logical thinking, which were on an average level.

### Diagnosis and differential diagnosis

On the basis of the history and the clinical and laboratory findings, the following diagnoses were made:

- moderate depressive episode (ICD-10: F32.1)
- attention deficit/hyperactivity disorder (ADHD, ICD-10: F90.0)
- dependence on sedatives/hypnotics (ICD-10: F13.2)
- cannabis dependence (ICD-10: F12.2)
- harmful use of opioids (ICD-10: F11.1)

In the differential diagnosis, a conduct disorder and a clinically relevant anxiety disorder were both ruled out.

### Treatment and further course

The patient was admitted to the intensive treatment section of the adolescent addiction ward, where he received withdrawal treatment with an oxazepam regimen. The patient manifested tremor of the hands and initially reported severe agitation. Oxazepam 10 mg q.i.d. was needed in the first 24 hours after admission. Within a week, oxazepam was weaned off, and he was given 30 mg of chlorprothixene thereafter as needed. Two weeks after admission, he was transferred to the psychotherapy area of the ward, where he received individual and group therapy with biographical, general youth psychotherapy and addiction-specific content. He also engaged in discussions with his mother. He participated in in-hospital schooling and received support in the planning of his personal perspectives. The urine cannabinoid level dropped to 31 ng/mL after two weeks of treatment, and the benzodiazepine level dropped below the level of detection. In subsequent regular controls, no substances were detectable. The depressive symptoms improved markedly under treatment. He still suffered from pronounced limitations in everyday life due to the manifestations of ADHD. He was given atomoxetine at doses of up to 65 mg daily, which was effective and well tolerated. Eight weeks after admission, he was transferred to the addiction day clinic for adolescents and underwent a four-week period of intensive, therapeutically accompanied trial reintegration into everyday life. He was then put in contact with the UKE outpatient clinic for child and adolescent psychiatry. Outpatient psychotherapy was resumed after discharge from the hospital.