

Emerging clues: Is this teen at risk for substance abuse?

Childhood characteristics may be predictive and suggest early interventions

Traditionally, clinicians have identified children at high risk for substance abuse disorders (SUDs) by their family history—such as “children of alcoholics.” Advances in etiology research, however, have led to the identification of other risks for SUDs seen during childhood (*Table, page 20*). The clustering of these SUD risk factors—genetic influences, family characteristics, and predictive phenotypes—makes it feasible to identify children and adolescents who are very likely to develop problematic substance use.

Nature vs nurture

Genetic influences. Heritable risk accounts for a substantial proportion of the variation in SUDs, as multiple genes differentially influence substance initiation, metabolism, and reinforcing properties.¹ For example, well-characterized genetic variations determine individual differences in alcohol dehydrogenase and aldehyde dehydrogenase—the enzymes involved in alcohol metabolism—and influence liability to alcohol use disorders (AUDs).^{2,3} Researchers are exploring ways in which genes might impact SUD risk (*Box 1, page 20*).^{1,4,5}

Genetic influences on substance use may be less important during adolescence than adulthood. In a study of 1,796 male twins’ alcohol, nicotine, and cannabis use from early adolescence to middle adulthood, genetic variations had little or no influence on substance use in early adolescence. The influence of genetic factors gradually increased with age.⁶

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Substance abuse risk

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Family factors that influence substance use include child maltreatment and inadequate supervision

Table

Risk factors for substance abuse in children and adolescents

Genetic predisposition
Parental substance use
Maltreatment
Inadequate supervision
Impulsive behavior, inattention, irritability
Substance availability
Early substance use

Box 1

Can genes predict substance abuse risk?

Recent investigations have examined genes that might confer risk across substance types. Promising research has focused on:

- genes that influence functional variations in neurotransmitter systems
- gene-environment interactions
- the search for neurobiological endophenotypes—characteristics that cannot be observed by conventional means, such as brain development characteristics that are seen through neuroimaging.^{1,4,5}

Specific molecular-level genetic variations can be measured in individual patients but cannot yet validly quantify risk.

Familial environmental factors, by contrast, were important in early adolescence and gradually decreased in effect with increasing age. During adolescence, the family's influence on substance use apparently operates more through environmental characteristics than through heritable factors.⁶

Familial influences. Parents with ongoing SUDs model problematic substance use and create environments of child maltreatment and inadequate supervision.

Child maltreatment. Children of parents with SUDs are more likely to suffer sexual abuse, physical abuse, or neglect.⁷ The effects of sexual abuse on the child may vary by abuse severity and the child's gender, developmental stage, and relationship to

the perpetrator. Maltreatment may cause the child difficulties in psychological regulation and social development, leading to related psychopathology; these characteristics may contribute to later SUDs.⁸

Inadequate supervision. Adolescents who report that their parents do not effectively monitor their activities have an increased likelihood of developing SUDs. However, children/adolescents who exhibit difficulties with psychological regulation—such as impulsive behavior and irritability—are difficult to parent, and adolescents with early substance involvement may subvert parental supervision efforts.^{9,10}

Predictive phenotypes

Predictive phenotypes—measurable individual characteristics that predict SUDs—may be considered risk factors but should not be viewed as causal influences akin to genetic and familial/environmental factors. Rather, predictive phenotypes may reflect propensities that are manifested by specific behaviors and other features according to developmental stage and environmental facilitation.

In other words, predictive phenotypes are observable childhood characteristics with systematic patterns over the course of development that predict SUDs. Not coincidentally, these predictive phenotypes are caused by many of the same genetic and environmental influences that cause SUDs. Phenotypes predicting SUDs include:

- specific psychiatric disorders
- specific personality traits that collectively are called psychological dysregulation
- early substance use.¹¹

Psychopathology. Childhood psychopathologies that predict SUDs include conduct disorder (CD), attention-deficit/hyperactivity disorder (ADHD), mood disorders, and posttraumatic stress disorder (PTSD).¹² These disorders are transmitted from parent to child in a developmentally specific fashion¹³ and cluster in high-risk children and adolescents.

Recent studies have demonstrated that this clustering of problems—including

ing impulsive behavior, inattention, and negative affect—represents a single continuous dimension termed psychological dysregulation.¹² The construct of psychological dysregulation has origins in neuropathology and provides a conceptual link between childhood psychopathological characteristics known to predict SUD and neurobiological deficits.⁵ Childhood indices of psychological dysregulation—such as the Behavior Rating Inventory of Executive Function (BRIEF)¹⁴—complement other risk factors, such as parental SUDs and early substance use, in predicting accelerated substance use and SUDs.¹⁵

Neurobiological characteristics. Recent investigations have focused on relationships between variations in normal brain development and differences in psychological regulation.⁵ Several brain structures thought relevant to the development of psychological regulation—including the prefrontal cortex, limbic structures, and reward circuits—develop during adolescence. Delays or deficits in the development of these structures are called neurodevelopmental dysmaturation.⁵

Variation in genes that influence these brain areas may interact with environmental influences—including child maltreatment and early substance use—to produce neurodevelopmental dysmaturation that manifests as psychological dysregulation. Thus, genetic and environmental causes are hypothesized to lead to an endophenotype (neurodevelopmental dysmaturation) and developmentally specific phenotypes, such as:

- ADHD in childhood
- CD and accelerated substance use initiation in early adolescence
- SUDs involving alcohol and cannabis in late adolescence.⁵

Early substance use initiation. It is rare for a person to begin clinically notable substance use in childhood (age 5 to 12), but adolescence (age 13 to 18) is characterized by substance use experimentation. Experimental substance use during adolescence is near universal and typically does not progress to SUDs.¹⁶ However, the type, ex-

tent, developmental timing, and context of substance use in early adolescence provide predictive information.

Consuming small quantities of alcohol under parental supervision is culturally normative and does not predict problematic drinking.¹⁷ On the other hand, regularly consuming “standard drink” quantities of alcohol in late childhood typically occurs in unsupervised settings and predicts adolescent-onset AUDs.¹⁸

Problem-focused interview methods—including CAGE, TWEAK, and CRAFFT—have been developed and tested to screen adolescents for AUDs. None has been as consistently successful as the World Health Organization’s Alcohol Use Disorders Identification Test (AUDIT) questionnaire¹⁸ (see *Related Resources, page 27*).

Childhood cigarette smoking also predicts accelerated substance use and SUDs.¹⁵ Marijuana use predicts both cannabis use disorders and other illicit drug use.¹ This observation supports the controversial “gateway hypothesis,” which proposes that marijuana use accelerates the onset of other illicit drug use.^{15,19,20} An alternate hypothesis proposes that use of marijuana and other illicit drugs is a developmentally specific manifestation of a more general liability for SUDs.¹

Identifying those at high risk

Screening for SUD risk factors makes it possible to identify children and adolescents who are very likely to develop problematic substance use. For example, in a study of 560 children age 10 to 12 at recruitment, this author (DBC) identified subjects as high risk if they had 2 parents with SUDs, tobacco or alcohol use by age 12, and high psychological dysregulation as measured by combined assessments of cognitive, emotional, and behavioral regulation. By age 18:

- three-quarters of these adolescents used tobacco daily
- more than one-half had alcohol problems
- nearly one-half had cannabis abuse or dependence.¹⁵

By contrast, children identified as low

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Conduct disorder, ADHD, mood disorders, and PTSD in children predict adolescent substance use disorders



Substance abuse risk

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Directly question parents and children about physical or sexual abuse, neglect, and use of alcohol, tobacco, and illicit drugs

Box 2

Web resources for parents, teachers, and teens

Parents/teachers

The National Institute on Drug Abuse (NIDA) provides a Web site for parents and teachers at www.drugabuse.gov/parent-teacher.html. Parents also can find resources at NIDA for teens at <http://teens.drugabuse.gov>.

The National Institute on Alcohol Abuse and Alcoholism (NIAAA) provides several free booklets for parents at www.niaaa.nih.gov/Publications/PamphletsBrochuresPosters/English.

My Brain, My Body (www.mybrainmybody.com) is an NIAAA-supported educational tool for teaching middle school students. Developmentally specific NIDA Junior Scientist Programs have been developed

for kindergarten through grade 5. The Office of Safe and Drug-Free Schools, part of the U.S. Department of Education, also provides relevant resources.

Children and adolescents

An NIAAA-sponsored educational resource (www.thecoolspot.gov) provides education on alcohol designed for young teens (age 11 to 13). The site includes quizzes, suggestions for resisting peer pressure, and activities that encourage refusing drinking opportunities.

NIDA for Teens (<http://teens.drugabuse.gov>) provides information and activities designed for those age 11 to 15.

risk (parents without SUDs, the absence of significant substance use, and low psychological dysregulation) were unlikely to have substance-related problems by age 18. Less than 10% had daily tobacco use, alcohol problems, or cannabis abuse or dependence.

Recommendations. Children and adolescents receiving health care services—including primary care, ongoing treatment for chronic conditions, and treatment for psychiatric disorders—should be evaluated for SUD risk. Screening ideally occurs at the initial evaluation or early in the course of treatment. Family history determines genetic risk.

Direct questioning is needed because unstructured evaluations often fail to reveal the presence of important SUD risks.²¹ Explore possible child maltreatment by questioning the parent and child about physical abuse, sexual abuse, and neglect. Key mental disorders include CD, ADHD, and PTSD. Ask about use of tobacco, alcohol, cannabis, and other drugs. Follow acknowledgement of use with inquiries on frequency, quantity, and problems.

Prevention and early intervention

By identifying characteristics that confer risk for SUDs, you can target these characteristics in prevention and early treatment

efforts. These efforts may involve parents as well as children. Many promising approaches have been developed, including universal or selective interventions based on family, school, community, or multi-component approaches.²²

Because parental SUDs are a prominent risk factor for children, interventions to reduce or eliminate parental substance use may be helpful, particularly for diminishing childhood psychological dysregulation.²³ Early treatment of childhood predictive phenotypes, including CD and ADHD, is another promising approach.¹² Community efforts to limit adolescents' access to addictive substances have met with some success.²²

These suggestions logically follow from the literature, but more effective prevention and early treatment approaches are needed. Our increasing ability to distinguish children and adolescents by their risk characteristics suggests that interventions targeted to specific risk characteristics and overall risk level may become more available.

Parents, teachers, and children and adolescents can obtain a wealth of information from the Web sites of the National Institute on Alcohol Abuse and Alcoholism and the National Institute on Drug Abuse (*Box 2*). The Centers for Disease Control and Prevention offers information about preventing smoking (see *Related Resources*.)

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Related Resources

- Alcohol Use Disorders Identification Test (AUDIT). World Health Organization. http://whqlibdoc.who.int/hq/2001/WHO_MSD_MSB_01.6a.pdf.
- National Institute on Alcohol Abuse and Alcoholism. www.niaaa.nih.gov.
- National Institute on Drug Abuse. www.nida.nih.gov.
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Disclosure

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Eliminating or reducing parental substance use may diminish children's psychological dysregulation

Bottom Line

Risk of substance use disorders (SUDs) is increased for adolescents who have parents with SUDs; home environments characterized by maltreatment and inadequate supervision; mental disorders such as attention-deficit/hyperactivity disorder and conduct disorder; and early substance use. Screen for these characteristics to identify at-risk children, and initiate preventive interventions.