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Advances in the Science of Adolescent Drug Involvement: Implications for Assessment and Diagnosis

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Abstract

Purpose of review—Adolescence is a developmental period characterized by relatively high rates of substance use and substance use disorders. Precise assessment and classification of adolescent drug use behaviors is essential in gaining an accurate understanding of the nature and extent of adolescent drug use, and possible intervention or treatment needs. There have been a select group of recently published research reports and manuscripts that address critical and emerging issues pertaining to the classification and assessment of alcohol and other drug use behaviors among adolescents. An overview of these publications is provided and their clinical relevance is discussed.

Recent findings—The paper will focus on recent research, most from the U.S., that addresses four main issues. One is the application of the new DSM-5 criteria to adolescents, including the advantages and disadvantages of the new criteria for substance use disorders. The second issue pertains to advances in instrumentation that provide new tools for researchers and clinicians in assessing substance use in adolescents. A significant public health issue is addressed as the third theme in the paper – screening for alcohol abuse in college settings. Finally, the paper reviews how the emerging science of brain development can inform the assessment process.

Summary—Recent advances in the adolescent drug abuse assessment field continue to inform clinical service and research. As a whole these advances have strengthened the field, but continued research is needed to further refine assessment practices and standards and to better understand how to define a substance use disorder in youth.

Keywords

adolescent; drug abuse; classification; assessment

Introduction

Accurate and developmentally suitable classification and assessment of adolescent alcohol and other drug involvement are essential for service providers and researchers who need an accurate assessment of in order to diagnose, guide referral decisions, assess the effectiveness of prevention and treatment programs, determine what predicts effectiveness, and to gauge the health service delivery needs of communities.

The body of this paper is based on a select group of recently published articles and reports, most drawn from studies conducted in the U.S., that represent progress in the field of

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Conflicts of Interest

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adolescent drug abuse assessment and diagnosis. Specifically, these topics will be discussed: the application of DSM-5 classification for adolescents; advances in instrumentation; screening practices for college binge drinking; and the implications of the emerging brain development science on assessment.

DSM-5 for Substance Use Disorders (SUD) and its Applicability to Adolescents

The new DSM-5 (1) diagnostic classification system, as well as the newer international system due out in 2015, the International Classification of Diseases - 11, offer revisions to the way some mental and behavioral disorders are defined and classified. The DSM-5 pertaining to SUD offers both changes and continuity. The DSM-5 SUD work group (2) proposed several changes. The major ones are i) that the SUD domain will be included within the Addictive Disorders category, which will include related addictive disorders, such as Gambling Disorder, ii) the elimination of the diagnosis of Substance Abuse, and iii) defining a single SUD for the various substance classes using a set of 11 symptoms. Ten of these symptoms are in the current DSM-IV abuse and dependence group of symptoms. The new 11th symptom is persistent drug use craving. Individuals would be assigned a diagnosis based on how many symptoms on that list the individual met: no disorder (0–1), moderate (2–3), or severe (4 or more) (www.dsm5.org). But similar to DSM-IV, a feature of the DSM-5 is that none of the criteria directly refer to drug use consumptions variables (quantity and frequency) variables.

Two commentary pieces were recently published that discussed the pros and cons of applying the DSM-5 criteria for SUD to adolescents (3, 4). Two positives of the DSM-5 were noted in both publications, and these changes have the potential to strengthen the validity of the SUD diagnosis for youth. First, the combined criterion set to diagnose a single SUD makes sense for adolescents (although the validity of a single SUD construct for adults is more open to debate (2)). The concepts of abuse (drug use that leads to harmful and hazardous consequences) and dependence (compulsive-like use in the face of negative consequences) as defined by DSM-IV have overlapping conceptual content (5) and statistically they represent a single dimension of substance problems, based on factor and latent class analyses (6). Also the DSM-IV abuse symptoms do not reliably precede the onset of dependence symptoms, which puts into question the notion that abuse is a precursor to dependence (7). Second, the elimination of the “legal problems” symptom also is an appropriate change for adolescents as this symptom tends to be less relevant for female and younger teenagers, and is too often significantly related to driving violations and to coexisting conduct disorder (7).

Nonetheless, the two papers raise several concerns about DSM-5 as applied to adolescents. Because some of the proposed DSM-V symptoms may be developmentally normative for teenagers and could be easily misunderstood and over-endorsed (e.g., tolerance), there is the danger that the low threshold for mild version of an SUD (2/11) will identify a very heterogeneous and non-clinically significant group of adolescents. This will result in many mild cases being identified yet they are false positives. Then there are concerns raised about 4 of the 11 criteria.

1. *Tolerance* to drugs, particularly to alcohol, often is a mild symptom and often occurs without clinically significant impairment. Also, brain maturation changes during adolescence (8) may mediate sensitivity to drugs during adolescence and thus too often contribute to false reports of legitimate tolerance.
2. *Withdrawal* symptoms may have prognostic significance in those few adolescents who report it, but it is only moderately associated with levels of problem severity

(6). Also, these symptoms are reported in a very low percentage of drug-abusing adolescents (9).

3. The *hazardous use* symptom is only minimally related to adolescent drug use, and a major reason for this is that adolescents have less access to automobiles than adults, which is a common way for individuals to meet this criterion (10).
4. The new SUD criterion to the DSM-5 is *craving* for drugs. Unfortunately, it is not clear as to the best way to assess signs of continued urges and craving-related behaviors in adolescents, even though clinical observations suggest that many heavy drug-using youth report strong cravings.

In sum, the DSM-5 for SUD provides some favorable changes as applied to adolescents. However, there is ample empirical evidence that some criteria for SUD, while suitable for adults, may not be for adolescents. Some targeted developmental adjustments would have been desirable, including clearer operational symptom definition of craving and Tolerance, and critically evaluating the diagnostic threshold for SUDs in adolescents. True, it is rare for the DSM system to have different diagnostic criteria based on age for a given disorder, but in the case of the DSM-5 SUD criteria, I think there was a missed opportunity.

Advances in Instrumentation

The adolescent drug abuse instrumentation field is well-populated with well-established and standardized instruments and measures. But recent efforts have afforded two noteworthy additions to the arena.

Alcohol Screening Protocol for Youth

This empirically-derived screening tool was based on a collaborative effort with NIAAA, American Academy of Pediatrics, clinical researchers, and health practitioners (11). Designed to provide a simple, quick, and empirically derived tool for identifying youth (ages 9–18 years) at risk for alcohol-related problems, this early detection tool aims to identify early stage alcohol-related problems in youth before the use and problems escalate to a severe level. The assessment protocol is part of a manual that also includes guidelines for a clinical response based on screening results (e.g., brief advice; brief intervention; referral for specialized treatment) (11).

The screener consists of just two age-specific core questions that can be included easily into the client interview or pre-visit screening questionnaire. One question focuses on the person's drinking frequency and the other question on peer drinking frequency. For elementary and middle school patients, the protocol begins with the less-threatening question about alcohol use by friends; the high school students are administered the personal use question first (see Figure 1). Research indicates that age-specific screening questions pertaining to personal and friends' alcohol involvement are powerful predictors of current and future alcohol problems among youth (12). Regarding elementary-aged youth (age 9 – 11), any drinking is considered a sign of risk behavior; for older youth, the number of drinking days in the past year provides the basis for risky behavior (see Figure 2). The "friends" question not only helps to identify adolescents at the early stage of alcohol involvement, but it also highlights an area for behavior change, inasmuch as this is an important risk factor of one's drinking.

PhenX Toolkit: Substance Abuse and Addiction (SSA) Collection

Drug abuse researchers have an excellent new resource when selecting measures and instruments. The PhenX Toolkit (13) allows researchers to review and select high-priority standardized measures and recommended assessment procedures for inclusion in broad-

based studies. All the measures, which were vetted by a panel of research experts, are of the highest psychometric standards, have a relatively low burden on respondents, and are in public domain. The full Toolkit provides recommendations for 330 measures across 21 content domains representing phenotypes commonly assessed by researchers studying the role of genetics on behavioral disorders and medical diseases (including SUD). The Toolkit's web site (www.phenxtoolkit.org) provides a brief description of each measure, the rationale for its inclusion, the standard protocols for collecting the data, and related references.

Use of PhenX Toolkit SSA measures makes it easy for drug abuse researchers to include a uniform set of core measures in their study design, collect common data, and contribute to the addiction sciences. The SSA collection involved a collaboration between NIDA, RTI International, the National Human Genome Research Institute, the Office of Behavioral and Social Sciences Research, and experience drug abuse researchers. This team identified assessment tools that yielded first- and second-tier core measures across these six specialty content areas: substance use and disorders, intermediate phenotypes, neurobehavioral and cognitive risk factors, psychosocial risk factors, community factors, and comorbidities and health-related outcomes. The first-tier core includes essential, low-burden measures that should be used in all drug abuse-related studies, such as current use status for alcohol, tobacco, and other addictive substances; age of first use; and 30-day quantity and frequency. The second-tier core includes important but more time-consuming measures, such as family history of drug abuse, social networks, socioeconomic status, behavioral undercontrol, and co-occurring mental health disorders. Measures for both youth and adults are identified in both tiers. Figure 3 provides an overview of the first-tier measures for substance use and disorders.

College Screening for Alcohol Abuse

The public health problem of college student binge drinking continues to receive a great deal of attention in the research literature and at colleges in westernized countries. A recent study examined the prevalence of screening for student alcohol problems among 333 U.S. colleges via a survey of campus leaders (14). There is extant research on what alcohol abuse screening tools hold the greatest promise in terms of psychometric properties for use with college students. The AUDIT, CUGE, CAPS and RAPS were judged to be the most favorable based on empirical comparative studies (15). However, the actual screening *practices* of colleges have not been heretofore systematically assessed. The Lenk study provides the first systematic assessment of screening services for student problem drinking across a large sample of U.S. colleges.

On the positive side, the authors found that most colleges conduct a formal screening after a student is involved in an alcohol-related incident, and nearly all colleges train legal, health care, and housing staff in screening procedures and practices. Yet screening usually occurs only after alcohol specific incidents rather than on a more routine basis, such as at regular health care visits. Only about half of colleges screened students at regular health care clinic visits (50%) and at regular mental health visits (54%). Also, whereas most colleges had some alcohol abuse screening components in place, more than one third of the colleges appeared deficient in terms of how, where, and when screening is conducted.

The main take home finding from this study is that colleges do not systematically screen students during routine health care and mental health visits. Doing so could increase a student's awareness that a drinking problem may exist, promote motivation for the student to seek a brief intervention or referral for more specialized services, and decrease the potential for the student to be involved in future alcohol- related incidents. Moreover, most

college most students do not seek out help for alcohol abuse or addiction (16); thus a policy of routine screenings is sound health policy given this context.

Brain Development Science

Background

Recent research has indicated that the adolescent brain does not fully develop until early adulthood (8). This general finding has led to heightened interest regarding the question as to whether the maturing brain is more susceptible to the effects of addictive drugs compared to a fully mature brain. Various animal and human studies have led to speculation that the developing adolescent brain may be highly susceptible to the acute and long term effects of alcohol use (17, 18). Also, recent findings from a longitudinal study in New Zealand suggest that persistent and adolescent-onset cannabis use was associated with neuropsychological decline broadly across domains of functioning, including IQ, even after controlling for years of education (19).

Implications for assessment

This emerging neuroscience also has implications for assessing adolescent behavior related to drug use. Structural and functional neuroimaging studies have shown that neural circuitry undergoes major reorganization during adolescence, particularly in those regions of the brain relating to *executive functions* (EF) (20). EF skills are associated with decision-making, working toward goals, critical thinking, adaptability, and being aware of our own emotions as well as those of others. Tests measuring different forms of these skills indicate that they begin to develop shortly after birth, with early childhood a window of opportunity for dramatic growth in these skills, and development continues throughout adolescence and early adulthood (21). Furthermore, there is compelling evidence that EF has a significant role in the etiology of drug use. For example, a composite measure of childhood self-control was found to significantly predict adult liability for a SUD (22). Also the EF construct may mediate effects of a drug abuse intervention. Our research group found that improvement in the adolescent problem solving skills mediated favorable drug use outcome at 6-months after a brief intervention (23).

In this light, it is important that clinicians and researchers in the adolescent drug abuse field include an EF assessment battery as a standard part of measuring an adolescents' risk and protective factors associated with drug use. The nature and extent of EF status may assist clinicians in identifying those adolescent clients with severe information processing deficits and for whom particular attention be paid to in terms of boosting EF-related skills (e.g., how to engage in better decision making when faced with social pressures to use drugs). Also, this construct may provide treatment researchers with clues as to possible mediators and moderators of treatment outcome.

Scientists have identified measurable components of EF, which include working memory, mental flexibility, and self-control. Fortunately, there is a resource to help professionals in the measurement of EF. For several years, officials at the National Institute of Health, along with national experts, have been building a multidimensional assessment battery, called the NIH Toolbox, for the assessment of cognitive, emotional, motor and sensory function from ages 3–85 (24). The Toolbox consists of measures that are standardized, have age-related norms, and are relatively brief to administer. It includes two EF measures – the Dimensional Change Card Sort Test (cognitive flexibility), and the Flanker Inhibitory Control and Attention Test (inhibitory control).

Conclusion

The last 2 years of research in the adolescent drug abuse assessment field provide several examples whereby important clinical and research advances have been made. New assessment resources and the advances in neurodevelopment provide signs of progress. Also, some changes in DSM-5 criteria for SUD may improve the validity of SUD among youth. Yet continued research work is needed to further refine how to best apply the SUD criteria for adolescents, and as the Lenk study showed, more research is needed to better understand the barriers for applying well-established screening procedures to youth in routine health settings.

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Key bullet points

- Screening for alcohol abuse can be done with reasonable precision by using 2-items.
- The DSM-5 for substance use disorders has both pros and cons for use with adolescents.
- Despite the availability of high utility screeners, it is unlikely that most colleges and universities screen for alcohol abuse during a student's routine health visit.
- The assessment of a person's executive functions (e.g., attention; working memory) should be a routine when evaluating an adolescent suspected of drug involvement.

Figure 1.
Administration Guidelines for the 2-items to Screen Youth at Different Ages (11)

Figure 2.
Recommended Cut-offs and Clinical Response as a Function of Age and Frequency of Use Past Year (11)

Element	Measures in Toolkit
Alcohol	Lifetime Use; 30-Day Use; Age of Initiation; Max Drinks in 24 Hours; Lifetime Abuse and Dependence
Tobacco	Smoking Status; 30-Day Use; Age of Initiation; Age of Offset of Use; Nicotine Dependence
Other Substances	Lifetime Use; 30-Day Use; Age of Initiation; Lifetime Abuse and Dependence

Figure 3.
The PhenX Toolkit Measures for Substance Use and Disorders (13)