

# Attention-deficit/hyperactivity disorder in postsecondary students

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**Abstract:** A PubMed review was conducted for papers reporting on attention-deficit/hyperactivity disorder (ADHD) in postsecondary students. The review was performed in order to determine the prevalence and symptomatology of ADHD in postsecondary students, to examine its effects on academic achievement, and discuss appropriate management. The prevalence of ADHD symptoms among postsecondary students ranges from 2% to 12%. Students with ADHD have lower grade point averages and are more likely to withdraw from courses, to indulge in risky behaviors, and to have other psychiatric comorbidities than their non-ADHD peers. Ensuring that students with ADHD receive appropriate support requires documented evidence of impairment to academic and day-to-day functioning. In adults with ADHD, stimulants improve concentration and attention, although improved academic productivity remains to be demonstrated. ADHD negatively impacts academic performance in students and increases the likelihood of drug and alcohol problems. Affected students may therefore benefit from disability support services, academic accommodations, and pharmacological treatment.

**Keywords:** adults, academic performance, stimulants, treatment

## Introduction

Although attention-deficit/hyperactivity disorder (ADHD) is widely recognized as a disorder of childhood, for the majority of children, symptoms persist through adolescence and into adulthood.<sup>1,2</sup> For those with ADHD, the transition period between adolescence and adulthood can be a particularly difficult time of life. The disorder often impairs behaviors essential for adaptive functioning across several domains, including academic, occupational, social, and psychological.<sup>3</sup> Appropriate support during this time may therefore be essential to ensure positive long-term outcomes.

Increasing numbers of individuals diagnosed with ADHD are pursuing postsecondary education and therefore face the transition into adulthood in the challenging environment of college or university.<sup>3,4</sup> Alongside the developmental changes occurring at this stage of their lives, students with ADHD at postsecondary institutions must also adapt to new environments and social groups and deal with greater educational and organizational demands, often combined with an abrupt loss of parental structure and support.<sup>3</sup> The management of postsecondary students with ADHD therefore presents a unique set of challenges.<sup>5</sup>

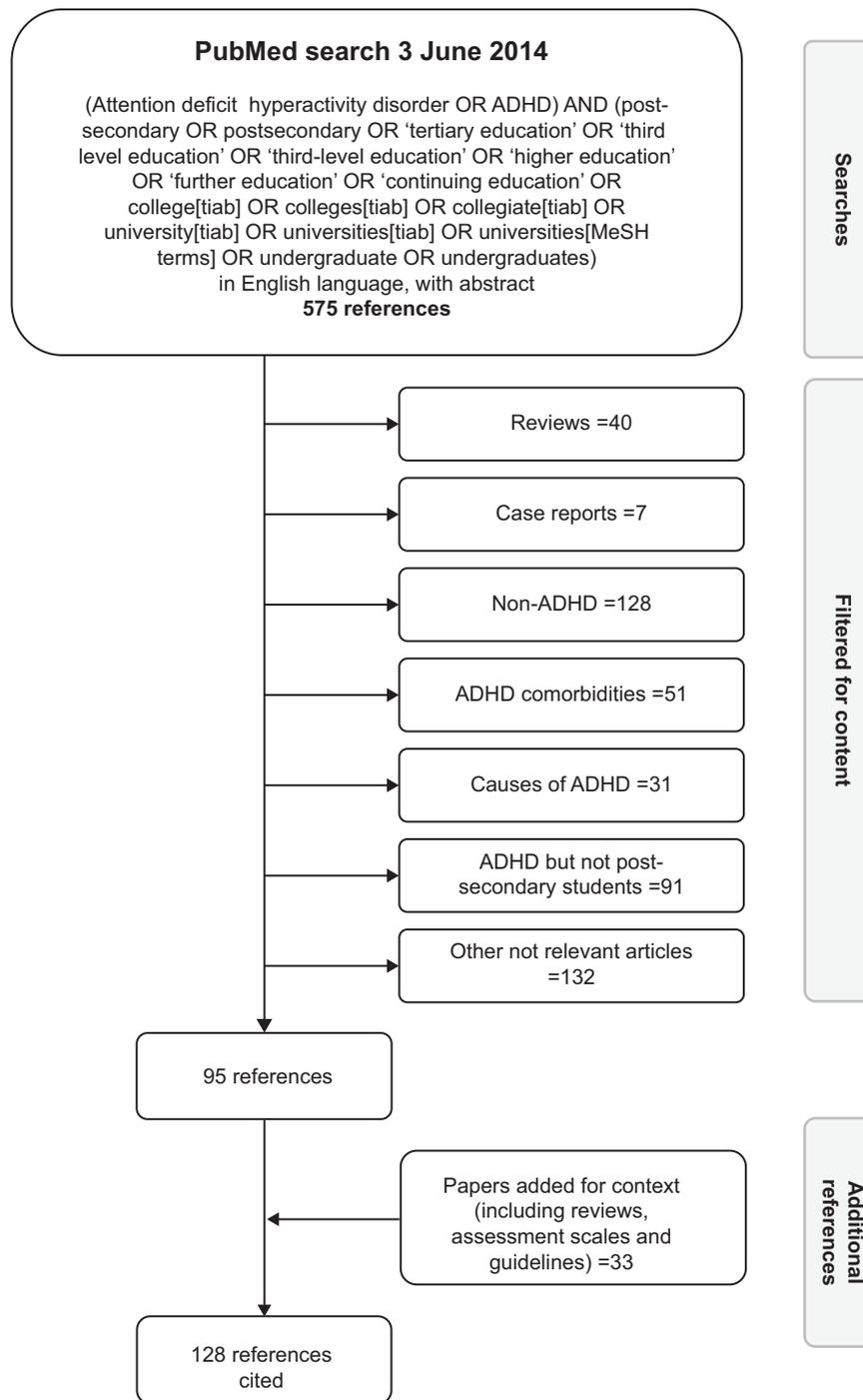
In this review, we examine the prevalence of ADHD in postsecondary students, describe the symptoms and characteristics of ADHD in this population, and discuss how ADHD affects academic achievement. We also consider how this condition can be most appropriately managed in the postsecondary setting and examine concerns regarding nonprescribed use of stimulant medication.

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## Methods

As shown in Figure 1, PubMed was searched to retrieve English-language papers with abstracts published up to June 3, 2014 using the following search strategy: (attention deficit hyperactivity disorder OR ADHD) AND (post-secondary OR postsecondary OR 'tertiary education' OR 'third level education' OR 'third-level education' OR 'higher education' OR 'further education' OR 'continuing education' OR college[tiab] OR colleges[tiab] OR collegiate[tiab] OR university[tiab] OR universities[tiab] OR universities[MeSH terms] OR undergraduate OR undergraduates) in English language, with abstract

education' OR 'further education' OR 'continuing education' OR college[tiab] OR colleges[tiab] OR collegiate[tiab] OR university[tiab] OR universities[tiab] OR universities[MeSH terms] OR undergraduate OR undergraduates). The relevant abstracts or full text of the 575 references retrieved using this search strategy were then reviewed. Principles for excluding articles included a primary focus that was not ADHD



**Figure 1** Literature search flow diagram to identify articles related to ADHD in postsecondary students.

**Abbreviation:** ADHD, attention-deficit/hyperactivity disorder; MeSH, Medical Subject Headings; tiab, Title/Abstract.

and articles which were not concerned with the prevalence, characteristics, effect on academic performance, and treatment or treatment-related issues in postsecondary students with ADHD. Additional references were identified from the reference lists of the selected papers and from the authors' own files, and these included reviews to provide context, articles describing assessment scales and treatment guidelines, and papers related to substance-use disorder and the nonmedical use of stimulants. "Postsecondary student" was defined as someone attending a postsecondary institution (college or university); age was not necessarily specified.

## Prevalence of ADHD in postsecondary students

Data on the prevalence of ADHD and ADHD-like symptoms in postsecondary students are limited. In North American college students, the reported prevalence of self-reported, clinically significant levels of ADHD ranges from 2% to 8%.<sup>4,6</sup> This problem is not confined to Western cultures: 15.4% and 23.7% of samples of postsecondary students reported high levels of ADHD symptoms in Iran and Kenya, respectively.<sup>7,8</sup> The upper end of this range is somewhat higher than the 4.4% estimated prevalence of clinically diagnosed ADHD in adults in the USA.<sup>1</sup> Basing prevalence estimates only on patients with a formal diagnosis may, however, underestimate the actual number of students with clinically significant symptoms of ADHD. In a study of 1,080 US college students, for example, 12% of the entire sample had clinically significant levels of ADHD symptoms as measured using the ADHD Self-Report Scale, whereas only 2% had received a formal diagnosis of ADHD.<sup>6</sup> Many students present to university counseling and health centers with previously unrecognized ADHD, and at least 25% of students accessing disability services are diagnosed with ADHD.<sup>4,9</sup>

## Symptoms and characteristics of ADHD in postsecondary students

Analysis of students with ADHD at US universities shows that the symptoms in this population conform to the bidimensional structure of the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV) criteria (ie, inattention and hyperactivity-impulsivity).<sup>10</sup> However, studies indicate that college students are more commonly diagnosed with symptoms of inattention rather than hyperactivity-impulsivity.<sup>11</sup> The symptoms of inattention, hyperactivity, and impulsivity, and the associated impairments in functioning, have clear negative effects on students in postsecondary education. Symptoms of inattention are of particular

concern, having been shown to have a substantial negative impact on college adjustment and academic performance.<sup>11-14</sup> Deficits in executive functioning, including impairments of working memory, are also associated with poorer academic achievement.<sup>15</sup> Hyperactivity, while not directly linked to academic performance, is associated with subjective feelings of restlessness.<sup>16</sup> Research indicates that the manifestation of ADHD symptoms among college students may be influenced by both sex and race.<sup>10,17-19</sup> In a recent study, for example, female students with ADHD were found to have higher rates of inattention, hyperactivity, and impairment than male students with ADHD.<sup>17</sup>

In university students, ADHD symptoms and associated disorders are negatively related with the individual's satisfaction with life.<sup>20</sup> In addition to the primary symptoms and impairments, studies indicate that college students with ADHD may be at risk of developing other problematic behaviors. For example, those with ADHD score significantly higher on scales measuring intrusive and worrisome thoughts than those without ADHD.<sup>21</sup> Although depression is observed more often among adults with a diagnosis of ADHD than among those without such a diagnosis, findings among students have been inconsistent, with some studies reporting higher levels of depression in students with ADHD than in students without the disorder, and others reporting similar incidences in the two groups.<sup>22</sup> College students with ADHD symptoms are more likely to have internet addiction, and increased rates of cigarette smoking, illicit drug use, alcohol-related problems, and risky sexual behaviors than those without ADHD.<sup>23-29</sup> In a study of US college students, those with greater ADHD symptoms were more likely to report risky sexual behaviors: less consistent contraceptive use, drinking more alcohol before sex, more intercourse with uncommitted partners, more impulsive sex, and more risky anal sex.<sup>30</sup> In college students with ADHD, effortful control and sensation seeking tendencies may influence the relationship between the severity of symptoms and risky behavior.<sup>31</sup> Of significance for those students driving to their educational establishment, the symptoms and impairments that are associated with ADHD may also have a negative impact on students' driving performance.<sup>32,33</sup>

## The impact of a college environment on ADHD

The transition from adolescence to adulthood is a period of important neurobiological change; in particular, the neurological bases for executive functioning are still being developed. The pathways underlying long-term motivation

may also continue to develop throughout this period of emerging adulthood. ADHD is believed to have a heterogeneous etiology, although alterations in two key neurotransmitters – dopamine and norepinephrine – are frequently implicated. These neurotransmitters are involved in many of the neurological processes that are found to be altered in ADHD, such as “cool” executive functions (eg, response inhibition and working memory), “hot” executive functions (motivation toward delayed versus immediate rewards), and temporal processing.<sup>3</sup>

The environment and timing of postsecondary education can be particularly challenging for individuals with ADHD.<sup>3</sup> This is a time in life that brings dramatic changes in lifestyle, independence, and responsibility. As students enter college, they must often cope with the abrupt loss of parental supervision and structure, combined with a sudden increase in independence in areas such as academic work, social activity, financial self-management, substance use and daily structure. These changes result in increased demand for organizational skills and long-term planning, while simultaneously providing the opportunity for distraction through the increased availability of immediate, short-term rewards. Coping with the increased demands and distractions of college life can be difficult for individuals without ADHD, but for students with ADHD, whose executive functioning and motivational systems are compromised, the challenges presented by the college environment may be far higher.

## Impact of ADHD on academic performance and achievement

Individuals with ADHD are more likely than their non-ADHD peers to terminate their education at the secondary level.<sup>34</sup> Those who do progress to postsecondary education may represent a subgroup of patients with the disorder with unusually high cognitive abilities and adaptive skills.<sup>5</sup> Nevertheless, there is wide agreement that students with ADHD have significantly lower university grade point averages, both at the beginning of their studies and throughout college.<sup>5,11,35–39</sup> Affected individuals are more likely to be placed on academic probation during their studies and are significantly more likely to withdraw from a course than students without ADHD.<sup>3,5,11,34,38</sup> Self-reports of study habits indicate that, compared with students without ADHD, students with ADHD take notes less frequently during lectures, and are worse at planning and completing class assignments, studying for exams, and avoiding distractions.<sup>11</sup> Of the primary manifestations of ADHD, inattentiveness appears to be a key factor influencing achievement among

students; this symptom is associated with decreased academic and social adjustment, poorer study skills, and more depressive symptoms.<sup>12,14,40</sup> Regression analysis in a sample of college students found that self-reported attention problems made a greater contribution to the prediction of grade point averages than did self-reported hyperactivity problems.<sup>13</sup>

## Assessment and diagnosis

The effects of ADHD on college students, including impairment of academic performance, an increased likelihood of drug and alcohol problems, and early termination of their studies, underpin the need to identify affected individuals and support them in the management of their disorder to improve their chances of a successful academic career. However, in a survey of US college health-care providers, while 38% accepted ADHD as a problem or very much a problem, fewer than half (48%) reported being comfortable or very comfortable in their ability to recognize the disorder.<sup>41</sup> Some students who have already been diagnosed with ADHD may choose to inform their college in order to receive additional support and educational accommodations; however, there is no formal requirement to report their disability on acceptance to college.<sup>42</sup> Even for those with an existing diagnosis, further evaluation by the college may be necessary. Family physicians, although able to diagnose ADHD in adults, do not usually assess the extent to which the condition impairs academic functioning, or the effect of medication on symptoms or academic performance.<sup>43</sup> Lack of communication between families, community physicians, campus faculties, and other care providers can delay identification of students with ADHD requiring support. To ensure that students with ADHD receive appropriate support, it is recommended that they have comprehensive records describing their level of functioning, verifying the extent to which ADHD currently impairs academic and other main life functions, and indicating whether any prescribed medication has improved impairments.<sup>43</sup> In addition, significant numbers of postsecondary students without an existing diagnosis were found to have clinically significant levels of ADHD symptoms as measured using the ADHD Self-Report Scale. More efficient strategies to identify and assess college students for ADHD deserve consideration.<sup>6</sup>

Clinician-administered testing for ADHD in children and adolescents is seen as normal practice. In adults, however, there is a greater onus on the patients themselves to assess their symptoms and functional impairments. Self-report screening tools that can be used to identify college students at risk of learning disorders and ADHD include the Web-based

Learning Difficulties Assessment, the Conners' Adult ADHD Rating Scale–Self-Report, the ADHD Self-Report Scale, and the Barkley's Quick-Check for Adult ADHD Diagnosis.<sup>44–47</sup> The Wender Utah Rating Scale, which has also been validated in college students, provides an indication of likely adult ADHD by assessing an adult's retrospective account of childhood symptoms associated with ADHD.<sup>48</sup> The Adult ADHD Self-Report Scale is reported to be an easy to use and cost-effective appraisal for gathering information about the symptoms of ADHD in postsecondary students.<sup>49</sup> Functional impairment associated with ADHD can be assessed using the self-report version of the Weiss Functional Impairment Scale.<sup>50</sup> However, while self-assessment does provide useful diagnostic information, it may be confounded by inaccurate or incomplete recall of symptoms and functional impairment, by misreporting non-ADHD psychiatric or non-psychiatric conditions, or by the desire of students to acquire certain benefits of diagnosis such as stimulant medication or academic accommodations. Thus, in addition to self-assessment, a thorough clinical interview including a historical evaluation is required to confirm the diagnosis and to exclude other psychiatric or non-psychiatric conditions in this population.

Corroboration of significant childhood symptoms, for example by review of report cards or completion of a parental questionnaire, is seen as best practice. However, this may not always be feasible, and a careful review of present and past ADHD symptoms remains the cornerstone of diagnosis. Indeed, there is some indication that informants may underestimate childhood and current impairment.<sup>51</sup> Also of note here, the recently published DSM-V requires that “several inattentive or hyperactive-impulsive symptoms were present prior to 12 years”, whereas DSM-IV required that “some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.” This change in diagnostic criteria provides a more realistic expectation of the clinician in clarifying the age of clear presence, as well as the significance, of early core symptoms.

Concerns have been raised that students without ADHD may feign or exaggerate ADHD symptoms in order to obtain educational accommodations or a prescription for stimulant medication.<sup>52–59</sup> It is not clear to what extent malingering occurs, but careful evaluation is required to ensure that resources are focused on the individuals who genuinely need such support and services. Although there is a perception among students that stimulant medication may improve academic performance, studies in adults without ADHD suggest that stimulants do not promote learning and may in fact impair performance in tasks that require adaptation,

flexibility, and planning.<sup>60</sup> Stimulant-induced improvements in cognition in individuals without ADHD were mainly evident in those with low cognitive performance, suggesting that stimulants may be more effective at correcting deficits rather than enhancing academic performance.<sup>61</sup>

## Support and management

A wide range of non-pharmacological support is available for individuals with ADHD, including academic accommodations provided through accessibility/disability support services, and assistance via counseling centers, health-care providers, and online support groups.<sup>43,62–64</sup> In addition, individuals with ADHD report that they receive help from parents, friends, teachers, and tutors.<sup>63</sup> Disability rights legislation means that, in most instances, colleges and universities are required to provide students with a disability the appropriate academic adjustments and auxiliary aids and services to allow equal participation in educational programs.<sup>65</sup> The process and information required to enable a student to qualify for disability support based on an ADHD diagnosis can, however, vary between institutions, and the practitioner may need to provide required clarification in order to ensure full qualification. A diagnosis of ADHD alone is not usually sufficient to qualify for academic accommodations, and evidence of impairment is also required.<sup>43</sup> Disability service providers in postsecondary educational establishments must decide on an individual basis which accommodations are appropriate and fair. Under certain circumstances this designation may also entitle the student to reduced course loads or special bursary support from student assistance programs.

For those who qualify, several academic accommodations are possible: additional time for exams, distraction-free examination rooms, deadline flexibility, note-taking services, tutoring, alternative formats for exams, and adaptive equipment and technology.<sup>42,65</sup> Despite the availability of these accommodations, there has been surprisingly little investigation into their effectiveness. Miller et al<sup>66</sup> have concluded that additional time allowances for exams confers an advantage to students with ADHD, whilst Lewandowski et al<sup>67</sup> suggest that students with ADHD should be considered for alternatives to additional time accommodations because they do not take longer over academic tasks but are prone to making more mistakes. ADHD coaching may also be offered as an adjunct to accommodations.<sup>68,69</sup> Investigations into the benefits of individualized coaching have suggested that this intervention can significantly improve student grades.<sup>68,69</sup> Students have reported that ADHD coaching helps them to become more self-regulated, leading to positive academic

experiences and outcomes.<sup>68</sup> Finally, a recent report indicates that computerized working memory training in college students with ADHD or learning disabilities may improve measures of working memory as well as reduce the number of ADHD symptoms.<sup>70</sup>

## Pharmacological interventions

International guidelines for the diagnosis and management of adult ADHD are available (Canadian Attention Deficit Hyperactivity Disorder Resource Alliance, European Network Adult ADHD, National Institute of Health and Clinical Excellence, and British Association of Psychopharmacology). Treatment plan recommendations vary in their detail across the international bodies; however, a multi-modal approach to treatment, consisting primarily of pharmacological intervention and/or behavioral therapy, is recommended. Several medications are approved for adult ADHD in North America, whereas in those European countries in which medication is approved for use in adults, it is limited to those with a previous diagnosis or evidence of childhood or adolescent ADHD.<sup>71</sup>

The efficacy of both stimulant and non-stimulant medications in reducing the symptoms of ADHD is well established. Meta-analyses of the efficacy of ADHD medications in 19 double-blind, placebo-controlled trials in adults with ADHD and 32 trials in children and adolescents with ADHD found that, in both age groups, effect sizes for immediate-release and long-acting stimulants were similar, and were greater than those for non-stimulants.<sup>72,73</sup> In a separate meta-analysis of 23 studies of amphetamine and methylphenidate products in children and adolescents with ADHD, effect sizes for amphetamine products were significantly greater than those for methylphenidate.<sup>74</sup> High variability among the studies included in the meta-analysis suggests that individuals with ADHD may respond differently to amphetamine and methylphenidate products. In all age groups, ADHD medications were effective in alleviating the symptoms of hyperactivity-impulsivity and of inattention.

Specifically in relation to academic performance, a recent meta-analysis of the effectiveness of drug treatment in children with ADHD suggested that methylphenidate, dexamphetamine, and mixed amphetamine formulations, but not atomoxetine, had the potential to improve children's learning and academic achievement.<sup>75</sup> To date, however, there is a paucity of clinical data on ADHD medications specifically in college students. One placebo-controlled study has been published that investigated the effects of an ADHD medication in a population of college students. In this double-blind,

crossover study, treatment with the long-acting prodrug stimulant lisdexamfetamine dimesylate was associated with large reductions in symptoms associated with inattention/memory problems and hyperactivity/restlessness as assessed using the Conners' Adult ADHD Rating Scale-Short Form, as well as large improvements in executive functioning and smaller effects on psychosocial functioning.<sup>76</sup>

Stimulants have also been shown to improve concentration and attention in adults with ADHD via their positive impact on driving performance, although this improvement may equally be due to medication-induced reductions in frustration and anger.<sup>32,33,77-82</sup> There is, however, currently no evidence to suggest that stimulants improve academic achievement in adults with ADHD over the longer term – surveys of college students have found no differences in academic attainment between students with ADHD treated with stimulant medication and those with ADHD not receiving such treatment.<sup>11,36,82-85</sup> Interestingly, although ADHD students taking stimulants did not appear to have improved grades compared with those with ADHD not taking stimulants, the perception among those taking stimulants was that these medicines do help them academically.<sup>11</sup> It is also possible, of course, that those who utilize ADHD medicines may have more severe ADHD symptoms and functional impairment than those who do not and that without their medication these individuals may have performed worse. Given these limitations, further research investigating the effects of medication on academic functioning is warranted.

Although generally well tolerated, all drugs for the treatment of ADHD can produce side effects, including decreased appetite and insomnia.<sup>76,86</sup> Of greater concern, however, is the potential for these drugs to cause acute cardiac events and, with repeated high-dose use, chronic changes in cardiovascular functioning, increased heart rate and increased blood pressure.<sup>76,87,88</sup> Nevertheless, a large, retrospective cohort study found no evidence suggesting that current use of ADHD medication was associated with an increased risk of serious cardiovascular events, including sudden cardiac death, acute myocardial infarction, and stroke.<sup>45</sup> In light of the potential side effects, guidelines recommend that patients undergo a physical examination and medical history evaluation prior to embarking on a course of ADHD medication, and that dose titration is started from the low end of the likely effective dose range; individual treatment responses are known to vary widely, both in terms of efficacy and side effects.<sup>89,90</sup> Ensuring that these drugs are well tolerated is important to achieve good adherence.

## Non-prescribed use of stimulants

ADHD in adults is associated with high rates of substance use disorder (SUD).<sup>91–96</sup> A recent longitudinal study in which children with ADHD were assessed for substance abuse by age 21 found that oppositional behaviors contributed significantly to cannabis or cocaine dependence.<sup>97</sup> Similarly, studies in college students found that childhood and current ADHD symptoms were significant factors in cannabis use and also that conduct problems predicted stimulant misuse.<sup>98,99</sup> The pharmacological action of stimulants on neurotransmitter systems suggests that they have the potential to induce dependence,<sup>87</sup> leading to the concern that treatment of children with ADHD medications may lead to increased susceptibility to later SUD.<sup>98</sup> In practice, although stimulants produce effects that could result in abuse among individuals without ADHD, the limited data available suggest that individuals with ADHD may not experience the same increased risk of substance abuse.<sup>87,100</sup> Indeed, in a longitudinal follow-up study, Biederman<sup>100</sup> reported that stimulant therapy protected youths with ADHD from substance abuse, whereas a recent meta-analysis<sup>91</sup> concluded that SUD was no different in individuals who had or had not a prior history of being prescribed ADHD medications. While the potential for abuse of extended-release stimulant formulations has not been researched extensively, studies suggest that the risks may be lower with long-acting stimulant formulations than with immediate-release formulations.<sup>101,102</sup>

The potential for abuse of pharmaceutical stimulants has led to concerns regarding the risk for diversion and misuse.<sup>103–105</sup> Several studies have investigated the prevalence of non-prescribed use of stimulants in postsecondary students with and without ADHD.<sup>35,87,104,106–117</sup> Within the college and university student population, life-time prevalence rates of non-prescribed stimulant use is in the range 5%–43%, and past-year prevalence rates in the range 5%–6% have been reported, with prevalence rates peaking in those aged 16–24 years.<sup>87,117,118</sup> Furthermore, while the misuse of stimulants is reported to be associated with the misuse of other substances,<sup>119,120</sup> a survey of a substantial US population (N=443,041) found that the nonmedical use of prescription ADHD stimulants is not commonly an initiating factor leading to the abuse of other prescription or illicit drugs.<sup>92</sup> Wide-ranging reasons have been given for the non-prescribed use of stimulants in this population. In some studies, students have reported taking non-prescribed stimulants to self-treat undiagnosed ADHD.<sup>35,111,121</sup> Indeed, there appears to be an association between the presence of ADHD symptoms and

the non-prescribed use of stimulants.<sup>85,121–123</sup> A cross-sectional study of US college students found that 71% of students who misused ADHD stimulants also had a positive screening result for ADHD symptoms.<sup>122</sup> Furthermore, misusers were seven times more likely to have symptoms of ADHD than those who did not misuse. The majority of misusers indicated that they misused stimulants to enhance academic performance. These observations add further support for improved screening of students to identify those with ADHD and therefore lower the incidence of non-prescribed use. Other nonmedical motivations for taking stimulant medications include the desire to enhance academic performance by improving attention and memory, to reduce fatigue, to achieve a stimulant high, and to lose weight.<sup>35,83,110–112,115,123–128</sup> Importantly, there is a correlation between nonmedical use of prescribed stimulants and other substance use (cigarette smoking, alcohol, and illicit drugs).

## Conclusion

Increasing numbers of individuals with an ADHD diagnosis are pursuing postsecondary education; however, many aspects of student life are particularly challenging for those with ADHD. College is often the time when individuals with ADHD are transitioning from adolescence to adulthood, and postsecondary education is characterized by greater organizational demands and the absence of close parental or teacher support. ADHD symptoms therefore have a substantial impact on individuals in the postsecondary setting, negatively affecting academic performance, increasing the chance of course failures and early termination of academic studies, and increasing the likelihood of drug and alcohol problems. Dropouts and course failures are likely to be associated with substantial costs to the postsecondary institutions.

ADHD is underdiagnosed in postsecondary students, and improved screening in this population may therefore be appropriate. To help students with ADHD overcome the challenges of postsecondary education and to ensure that they reach their academic potential, additional support and accommodations may be required. Pharmacological treatment may help to reduce ADHD symptoms and improve executive functioning; however, further studies are required to investigate the effects of ADHD medications on long-term academic achievement – for example, graduation rates – in this population.

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