THE ACADEMIC SUCCESS OF COLLEGE STUDENTS WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER AND LEARNING DISABILITES

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ABSTRACT

ERICA LYNN RICHMAN: The Academic Success of College Students with Attention Deficit Hyperactivity Disorder and Learning Disabilities
(Under the direction of Dr. Sheryl Zimmerman)

The importance of graduating from college is well documented but unfortunately, students with ADHD, LD, or both often face considerable challenges while pursuing their undergraduate degrees. Both research and literature in this area are scarce. This work helps fill this gap and increase understanding of ADHD and LD students in college. Paper one contains an extensive review of the literature and social policies which are used to examine the complexities surrounding the academic success of this vulnerable and growing group. Paper one also describes mandated and optional intervention strategies that support these students, and evaluates the evidence base for six frequently used optional interventions.

Paper two describes the characteristics, diagnoses, service use patterns, and academic success of students approved for ADHD and or LD services at one large public university. Using regression analyses, it examines the relationships among those variables. Paper three uses propensity score matching and a survival analysis to compare the academic success of students eligible to use ADHD /LD support services with a large control sample.

Results of paper one indicate that the field of disability services is moving toward greater reliance on evidence based practice, but the current level of evidence remains

inadequate. Overall there was a mix of results some supports were tested and validated among students with ADHD/LD, some require more research but showed great promise and still some require substantially more research to determine their effectiveness

Paper two yielded many important outcomes, among the most salient were that ADHD/LD students take longer to graduate than the average student, and the difference is significantly greater for students who only use accommodations. Also, most students who register for services do actually take advantage of them, but those who never return are no worse off academically. Further, students who had more service contacts were more likely to have higher GPAs. Paper three confirms that ADHD and/or LD students experience less academic success than the average student. They are less likely to graduate, take longer to do so, and as compared with nondisabled peers, they have lower GPAs and higher rates of withdrawals, ineligibilities, and course underloads.

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ADHD	Attention Deficit Hyperactivity Disorder
ADHD/LD	Attention Deficit Hyperactivity Disorder, Learning Disabilities, or Both
GPA	Grade Point Average
LD	Learning Disabilities
SATM	Math SAT Score
SATV	Verbal SAT Score

INTRODUCTION

THE ACADEMIC SUCCESS OF COLLEGE STUDENTS WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER AND LEARNING DISABILITES

Attention deficit hyperactivity disorder (ADHD) and learning disabilities (LD) are neurological disorders that frequently co-occur and have many similar symptoms (APA, 2002). Students diagnosed with one or both often face considerable academic and social difficulties that are intensified during the transition to college and throughout postsecondary studies (DuPaul, Weyandt, O'Dell, & Varejao, 2009). Students with ADHD and LD report substantial difficulties in the areas of time management, information processing, concentration, motivation, and anxiety (Reaser, Prevatt, Petscher, & Proctor, 2007). Despite the consistent finding that students diagnosed with both disorders or only one (ADHD/LD) fare worse in college than their non-disabled peers, data on the academic success of this group are limited and very little is known about the demographics and characteristics of this population.

University-based support services offer potential interventions to mitigate the risk of social and academic difficulties among students with these disabilities. Services provided on campuses for students with ADHD/LD however, are not typically supported by empirical research; rather, these supports are often based solely on clinical wisdom and anecdotal evidence. Given the increasing number of college students with ADHD/LD (Orr & Hammig, 2009), programs are in urgent need of rigorous evaluation to test their effectiveness. The lack of appropriate evaluation of these interventions means that

colleges and universities might be spending precious resources on ineffective student support programs. Rigorous evaluations would be of importance to practitioners, policy makers, and students to understand which services are effective for whom and whether service use impacts academic success, social relationships, and life satisfaction of students with ADHD/LD.

While the evidence base of college support services is scarce, there is also little existing information regarding basic characteristics of this growing population of vulnerable students. Information related to demographics, diagnoses patterns, variation in the extent to which students use services, characteristics associated with the distinct service use groups, and above all, the rates of academic success are all unknown in the field. Evidence indicating whether service use has an impact on academic success among students with ADHD/LD for example, could be valuable to service providers in planning effective services. If data indicated a particular group never took advantage of services, then practitioners could conduct assessments to understand better student needs and modify services to ensure efficient use of resources and as a result, improve student grades and graduation rates.

The importance and benefit of graduating from college are well documented. Consistent data report that a college education leads to better employment (e.g. increased mobility, security, and autonomy), financial earnings, and social status for both the general population and people with disabilities (Gilmore & Bose, 2005; U.S. Census Bureau, 2002; Tagayuna, Stodden, Chang, Zeleznik, & Whelley, 2005). Given the clear evidence of the importance of obtaining a college education, the success ADHD/LD students attain in postsecondary educational settings warrants greater attention. Reports

that students with ADHD/LD do not seem as successful as their nondisabled peers on measures of GPA, graduation rates, and time to graduation can be found, but they are based on unadjusted data that do not consider other differences among students, such as gender and race. Further, controlled studies related to the academic success of students with ADHD/LD are rare; the few that exist tend to focus on students with a diagnosis of either ADHD or LD rather than the common co-morbidity of these conditions, and are based on small sample sizes and self-report measures (Heiligenstein, Guenther, Levy, Savino, Fulwiler, 1999; Weyandt, & DuPaul, 2006).

Each paper in this dissertation addresses an important set of questions related to college students with ADHD/LD that have not yet been answered. Paper one lays the ground work by describing the challenges that many students diagnosed with ADHD/LD must face and overcome when pursuing postsecondary educational goals. It contains an extensive review of the literature and an analysis of related social policies which are used to examine the complexities surrounding the academic success of this vulnerable and growing group of college students. In addition, the article describes both mandated and optional university-based intervention strategies to support these students, and evaluates the evidence base for six frequently used optional interventions: assistive technology, learning strategy instruction, coaching, tutoring, support groups, and summer transition programs. Overall, this information provides a foundation for research aimed at providing effective, evidence-based services for college students with ADHD and LD.

Paper two expands on the first manuscript by describing in detail the characteristics, diagnoses, service use patterns, and academic success of students approved for ADHD/LD services at one large public university. Further, using regression

analyses, it examines the relationships among those variables while adjusting for potentially confounding factors. To conclude, paper three attempts to fill the expansive literature gap by closely examining the association between having ADHD/LD disabilities and academic success using rigorous research methods. Propensity score matching (PSM) is employed to compare the academic success of students eligible to use ADHD/LD support services in one college with a large control sample of students from matching cohorts. Lastly, a survival analysis was conducted to further assess academic achievement of ADHD/LD students in postsecondary education.

ADHD/LD students are a vulnerable population that faces barriers in college and are often stigmatized for difficulties in college that are actually unrelated to their intelligence levels (Cordeiro, et al., 2011). It is important that social work as a field, pay attention to developing interventions so this population gets the support they need. The testing of interventions related to college success is not frequently undertaken even though most campuses invest a great deal of time and financial investments into what are possibly ineffective interventions. Section 504 of the Rehabilitation Act requires some basic assurances are in place (Fisher & Happell, 2009), but further than that, it is up to school policy makers to push this important agenda beyond simple access to school and basic accommodations.

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PAPER I

COLLEGE SUCCESS OF STUDENTS WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER AND LEARNING DISABILITIES: COMPLEXITIES, POLICIES, AND SERVICE DELIVERY

Overview

The purpose of this work is to review the relevant literature, describe the related institution-based interventions, explore the evidence related to the voluntary interventions, and make recommendations for maintaining and improving the use of evidence-based practices in college-based offices that serve students with Attention deficit hyperactivity disorder (ADHD) and learning disabilities (LD). In this work, *services* will refer to all supports offered in ADHD and LD (ADHD/LD) offices while *accommodations* will refer only to legally mandated supports.

ADHD and LD are chronic conditions that can have deleterious effects on the academic success of college students. Although distinct, the two disorders often co-occur and are diagnosed comorbidly 45% of the time (DuPaul, Gormley, & Laracy, 2013). The diagnosis of ADHD is given when a person shows a persistent display of behavioral patterns characterized by inattention, impulsivity, and hyperactivity; current thought holds that ADHD is most often transmitted genetically (American Psychiatric Association [APA], 2000). Although ADHD was once assumed to affect only children, the characteristic behavioral patterns (e.g., inattention, hyperactivity) can have profound negative effects on an individual's quality of life and adaptive functioning at every life

stage (Biederman et al., 2006; Meaux, Green, & Broussard, 2009). In contrast to ADHD, diagnoses for LD are usually sought when parents or teachers observe a significant discrepancy between an individual's intelligence level and his or her academic achievement (APA, 2000). However, the student's achievement on standardized tests in reading, mathematics, or written expression must be substantially lower than expected to warrant a diagnosis of LD. Both disorders can be more specifically diagnosed into subcategories; for example a LD might be particularly related to math or language, and ADHD could be considered the inattentive or the hyperactive type.

ADHD and LD[1] share many symptoms and behaviors, including problems with inattention and hyperactivity, low tolerance of frustration, low self-esteem, low morale, deficits in social skills, increased rates of school drop out, and poor vocational achievement (APA, 2000). Students who suffer from one or both disorders are likely to experience serious challenges in academic settings as well as in social relationships at home and work (Reaser, Prevatt, Petscher, & Proctor, 2007). Given the extent of difficulties encountered by many of those with ADHD/LD, it is no surprise that this group faces serious challenges in the postsecondary educational setting, which is a pivotal stage with life-changing effects (DuPaul, Weyandt, O'Dell, & Varejao, 2009).

Data consistently show that individuals who attain higher levels of education, especially postsecondary education, benefit through improved employment prospects, increased financial earnings, and elevated social status (Gilmore & Bose, 2005). For example, evidence supports that each consecutive level of education results in higher

[1] Although distinct disorders, this article uses ADHD/LD for ease of reference when information applies to both.

lifetime earnings: on average, a high-school graduate earns $1.2 million, a person with an associate's degree earns $1.6 million, and one who holds a bachelor's degree earns $2.1 million over the span of his or her working career (U.S. Census Bureau, 2002). In addition, as compared to individuals with a high school education or less, those who complete college have more personal savings. Moreover, attaining higher levels of education promotes professional advancement, improves the quality of life for offspring, and enhances consumer decision making (Porter, 2002). Similarly, for persons with disabilities in particular, completing a postsecondary degree (or similar accomplishment, such as completing a technical or vocational program) is associated with improved life satisfaction, employment outcomes, and likelihood of achieving financial independence (Tagayuna, Stodden, Chang, Zeleznik, & Whelley, 2005).

Although the economic and social value of higher education is well documented, individuals with disabilities face more barriers to attaining a postsecondary degree than do others. Compared with their peers without ADHD, college students with ADHD experience greater emotional and behavioral difficulties during the transition to college, have more academic problems, earn lower grade point averages, and are more likely to be put on academic probation (DuPaul, Weyandt, O'Dell, & Varejao, 2009). Also, there is consistent evidence that persons with disabilities achieve less academic success in college, (e.g. lower rates of graduation), (Milsom & Hartley, 2005), a finding that is confirmed specifically for students with learning difficulties (Heiman & Precel, 2003; Murray, Goldstein, Nourse, & Edgar, 2000). Not surprisingly, these increased difficulties are reflected in lower graduation rates of students with ADHD/LD. As compared with the average graduation rate of 64% for students without disabilities, the graduation rate of

college students with ADHD/LD ranges between 30% and 53% (Greenbaum, Graham, & Scales, 1995; Horn, Berktold, & Bobbitt, 1999).

Fortunately, university-based support services offer potential interventions to mitigate the risk of drop out among students with these disabilities, and thus promote the academic success of students with ADHD/LD who are pursuing postsecondary education. However, little empirical evidence exists to inform university-based services for students with ADHD/LD disabilities. Unfortunately, current programs in this area tend to be based on good intentions and anecdotal evidence rather than scientific evidence supported by rigorous research and testing.

The American's with Disabilities Act (ADA) of 1990 ensures that students with ADHD/LD have access to opportunities for postsecondary education (Allsopp, Minskoff, & Bolt, 2005). Since the enactment of the ADA legislation, the number of college students with disabilities has increased, due either to more students with disabilities entering college or students' increased willingness to self-identify as having a disability. Currently, 11% percent of all full-time college students attending 4-year universities in the United States self-identify as having a disability (NCES, 2008). Of these students, those with ADHD/LD are the largest and fastest growing group (Orr & Hammig, 2009), and consequently, are also the largest group of postsecondary students served by college and university offices for students with disabilities (Harbour, 2004).

Despite the well-documented, positive outcomes that have emerged regarding the benefits of postsecondary education, and the fact that increasing numbers of students with ADHD/LD are entering universities, research related to this population is extremely limited. For example, postsecondary institutions do not release information specific to the

academic success of students with ADHD/LD such as the grade point averages (GPA) or graduation rates of these students, and whether these students have other psychological diagnoses. Similarly, scholarly literature in this area is remarkably scarce, and research exploring effective practices to assist students with ADHD/LD is almost nonexistent. To date, there has been little indication that any universities or colleges have undertaken rigorous program evaluation of disability services offered at the postsecondary level.

One study conducted more than a decade ago examined the literature surrounding college-based services for students with only LD, and found almost no indication that any services improved academic outcomes (Rath & Royer, 2002). However, the services have changed over the last ten years such that Rath and Royer's findings may be no longer applicable. For instance, the technology they evaluated consisted of items now widely available and outdated, including books audio recorded onto cassette tapes and word processors with spellcheck capabilities. Interventions included professional therapy and counseling which is no longer in the purview of most university-based ADHD/LD support services offices. Perhaps the most glaring evolution is that services for students diagnosed with ADHD were not considered relevant to their research. Given the escalation in recent years of ADHD diagnoses and ADHD/LD comorbidity rates, Rath and Royer's research would likely include ADHD student concerns if they conducted the same study today.

Difficulties Faced in College

The typical experiences of college students with ADHD/LD differ substantially from those of students without disabilities. For example, they tend to experience severe setbacks during the transition from high school to college, which is a particularly critical

period as evidenced by a nearly 50% attrition rate during the first year for all students (Tinto, 1998). Often, students enter college with a sudden, dramatically increased level of responsibility and independence, making college life confusing and difficult for even those who show strong potential (Farrell, 2003). Students with ADHD/LD often are unprepared for this transition (Meaux et al., 2009). Most college freshmen with ADHD/LD have not begun to advocate for themselves and many persist in the belief that they should be able to accomplish their goals without help. Many students with these disorders have a limited awareness of the extent of the consequences that their disabilities can impose (Farrell 2003). Poor decision making and the newness of college life can lead to academic failure, risky health behaviors, and decreased quality of life (Farrell, 2003).

Students with ADHD/LD report substantial executive functioning difficulties, such as self-regulatory functions that manage cognitive activities, emotional responses and behaviors (Gioia et al., 2001); they have trouble managing their concentration, motivation, and anxiety, and are likely to struggle with information processing and learning skills. In addition to executive functioning problems, people who suffer from ADHD/LD also experience high rates of depression, anxiety, substance use, impulse-control disorders, and other psychosocial problems (Barkley & Brown, 2008; Blase et al., 2009; McGillivray & Baker, 2009). Prevalence rates of comorbid depression and ADHD/LD vary from 40% to 86% (McGillivray & Baker, 2009), which contribute to the academic difficulties these students face.

Although a great deal of conjecture exists regarding the needs and characteristics of college students with ADHD/LD, few empirical studies have been conducted to support such speculation. For instance, the current array of accommodations and services

provided on campuses for students with ADHD/LD are not supported by empirical research; rather, these supports are based solely on clinical wisdom followed by anecdotal evidence. Given the increasing number of college students with ADHD/LD, these programs are in urgent need of rigorous evaluation to test their effectiveness. Results of these evaluations would be of importance to practitioners, policy makers, and students to understand who need information on which services are effective for whom and whether services impact grades, social relationships, graduation rates, and life satisfaction of students with ADHD/LD.

Research to identify what accommodations best serve the learning styles of students with ADHD/LD has important implications for policy and practices in higher education settings. The purpose of this article is to review the practice and policy literature from the education and disability fields, and to describe the related institution-based interventions. In addition, this article explores the evidence related to voluntary services (i.e., beyond mandated accommodations) provided by some universities. Finally, recommendations for maintaining and improving the use of evidence-based practices are discussed in relation to disability services for students with ADHD/LD.

Role of Evidence-Based Practice in Disability Services

Over the past 20 years, the U.S. government has adopted policies aimed at fiscal responsibility that require government-funded programs to be empirically evaluated for effectiveness. For example, the No Child Left Behind Act of 2001, and the Individuals with Disabilities Education Act (IDEA) of 2004, tied funding for public schools to requirements that instruction for students ages 3-21 years with disabilities use teaching methods that have been shown effective through scientifically based and peer-reviewed

research (Eisenhart, & Towne, 2003; Zirkel & Rose, 2009). The intent of policy requiring evidence-based programs is to decrease the likelihood of implementing programs that are later shown to be ineffective or, perhaps, harmful.

The concept of evidence-based practice (EBP) evolved from the philosophy of evidence-based medicine, which emphasized making patient-care decisions based on careful consideration of an array of data, including patient report, clinician observations, and research outcomes (Sabah & Orthner, 2007). Undergirding evidence-based medicine is the idea that systematically studying, recording, and then dispersing knowledge of the effectiveness of interventions is essential to the continuing growth of medical knowledge. EBP has now been embraced worldwide in the health care field and in a variety of educational settings (Scott & McSherry, 2009).

EBP not only recognizes the ongoing development of new knowledge, but also demands that practitioners stay abreast of developments in their field and use evidence-based "best practices" that are most effective for specific clients and specific settings. EBP should play an important role in disability services provided at the postsecondary level. To fully realize the potential of EBP in disability services for postsecondary students, greater collaboration between practitioners and researchers is needed to establish an evidence base for interventions currently in use and to develop and test new interventions. Priority should be given to applying the rigor of evidence-based intervention research to current programmatic components (Fraser, Richman, Galinsky, & Day, 2009) as practiced in university-based services.

Disability Law and Higher Education

Although many funding agencies insist that programs use EBP interventions, no legislation has yet been enacted that mandates universities and colleges to use EBP services for students with disabilities; however, some service guidelines have been provided by various policies. Legislation such as the ADA of 1990 and Section 504 of the Rehabilitation Act of 1973 require postsecondary institutions to make "reasonable accommodations" to meet the needs of students with disabilities and to provide nondiscriminatory procedures for students to secure those accommodations (Fisher & Happell, 2009). Reasonable accommodations are specified as making facilities accessible, developing appropriate modifications or adjustments to examination procedures, and providing interpreters or other services to reduce the impact of a person's impediment on his or her ability to participate in and benefit from offered programs (Stodden, Jones, & Chang, 2002). In addition, both the ADA and the Rehabilitation Act of 1973 (and its subsequent 1986 and 1992 amendments) specifically prohibit disability-related discrimination in postsecondary admissions and post matriculation (Madaus & Shaw, 2004). As civil rights legislation, these laws mandate that funding for student disability services be the responsibility of the postsecondary institutions.

Although the above provisions are required by federal law, these requirements encompass only the most basic services that postsecondary education institutions must offer. Schools are not restricted to these basic services, and institutions are encouraged to use the mandated services as a foundation from which to build comprehensive and individualized services (Kravets & Wax, 2007). However, given the lack of outside

funding for disability services and the budgetary crises and constraints of most schools, efforts to go beyond required services are often insufficient.

University-Based Support Services

Mandated and optional support services are generally offered to students with ADHD/LD through dedicated disability services offices or departments. To access these services, a student must voluntarily declare or register his or her disability status with the appropriate institutional unit (Stevenson et al., 2003). Whereas young adults often report admitting their disability to themselves was challenging, disclosing that information through a formal process in a university setting might pose an insurmountable barrier due to social stigma or other personal reasons (Stevenson, Stevenson, & Whitmont, 2003), but the student is required to report and justify her or his request for accommodation with appropriate medical documentation. Generally, students are deemed ineligible for support services if they do not have documentation of a confirmed diagnosis from a qualified medical professional; tests to diagnose ADHD or LD are not available at these offices. Interestingly, recent information provided by Consumer Reports (2010) indicates that professional evaluations of ADHD can cost up to $2,500, a figure that may be cost-prohibitive to some individuals/families. It may translate, therefore, that colleges who only provide services to diagnosed students are perhaps unintentionally discriminating against lower income students.

University-based disability services function in an environment that has experienced continuous change since their development in the early part of the 20th century (Hodges, 2001). Early in the development of services, students' issues related to disability and mental health were handled individually and privately by faculty. This

unofficial protocol existed when college students tended to be a highly homogeneous group of upper-class White males. After World War I, however, the college-bound population grew in numbers and diversity to eventually include military veterans, older students, married students, and substantially higher numbers of women and minority populations. These changes multiplied dramatically after World War II and the passage of the Servicemen's Readjustment Act of 1944 (P.L. 78-346), better known as the GI Bill. Faced with these changes, faculty could no longer handle the number of students needing accommodation for disabilities and mental health issues (Hodges, 2001). Thus, the increasing diversity of the student body and increasing numbers of students with disabilities intensified the need for coordinated, comprehensive university-based social and mental health services.

The type and extent of disability services available to students with ADHD/LD varies widely across U.S. postsecondary institutions (Kravets & Wax, 2007), with the only constant being the reasonable accommodations mandated by federal law. Further, the dissimilarity of disability services across colleges and universities is thought to be a consequence of the lack of an evidence base for these services (Yost, Shaw, Cullen, & Bigaj, 1994). Moreover, the few services with an evidence base tend to be rooted in programs that have shown promise with children and non-student adults (Brown et al., 2008), but have not been evaluated with adult students. The lack of appropriate evaluation of these interventions means that colleges and universities might be spending precious resources on ineffective student support programs.

Consequently, the remainder of this paper informs the EBP evolution of disability services by determining the most commonly used university-based supports for

students with ADHD/LD, identifying the legal status of these supports (i.e., mandated or optional), describing each support, and finally summarizing the related evidence for the optional programs. While mandated services are already uniformly offered, uncovering strong evidence bases supporting non-mandated services could result in wider use of efficacious interventions and impact the direction of future university-based interventions for students with ADHD/LD.

Methods

This study sought to present a foundation for research aimed at providing effective, evidence-based services for postsecondary students with ADHD/LD and thus explored peer-reviewed literature that was written in English (using PsycInfo and ERIC databases) and was related to university-based accommodations and services. Searches used keywords ADHD and LD combined with about 30 other search terms such as college, post-secondary, graduation, accommodations, support groups, GPA, learning strategies, and success. Fifteen frequently offered supports were identified by a professional who has worked in the area of ADHD/LD students in colleges for many years and then compared with services indicated in a popular guide book of college services for parents whose children have ADHD/LD and are applying to colleges (Kravets & Wax, 2007). All 15 were defined and then the six services not already mandated by law (i.e., assistive technology, learning strategy instruction, coaching, tutoring, support groups, and summer transition programs) were further evaluated for efficacy based on findings published in peer-reviewed journals. Findings are discussed in detail and suggestions for movement toward the increased use of EBP in university offices are specified.

Results

The literature indicated that the six voluntary supports range from having no evidence of effectiveness to a substantial amount of persuasive evidence. These services and the evidence base for each are discussed in depth below. Table 1 summarizes the University-based supports provided without cost to students who have a documented ADHD/LD diagnosis.

Table 1: *University-based Supports for Students with ADHD and LD*

Accommodation or Service	Definition Students are offered…
Legally Mandated Supports	
Extended test time	a longer amount of time to complete their exams.
Distraction-free test site	an environment without distractions to take their exams.
Test-taking accommodations	computers to type essay exams or to have someone read the exam aloud.
Priority class registration	the ability to register early and at a convenient time, ensuring their entry into courses that might close.
Course substitution	option to substitute a required course (usually math or foreign language) with course better suited to individual's needs.
Reduced course load	option to enroll in fewer classes per semester than the number typically required to maintain full-time student status.
Audio-Recorded Class	an audio recording of class lessons.
Note assistance	copies of class notes written by another student or supplied electronically.
Audio versions of course readings	individualized audio versions of course textbooks and supplementary re
Voluntary Supports	
Assistive technology	use of a recording device that links lessons to class notes and can be repeatedly reviewed, as well as use of a device that automatically generates text on a computer from speech.
Learning strategy instruction	specialists who provide instruction in how to develop strategies for time management, taking tests, organization, speed reading, using technology, note taking, studying, and other areas.
Coaching	weekly one-on-one meetings with a trained coach whose aim is to

	help students set and meet goals and be accountable.
Tutoring	weekly tutoring sessions for subjects in which the student is having difficulty.
Support groups	weekly meetings with ADHD and LD peers to discuss difficulties, successes, and related issues.
Summer transition programs	summer school courses, room and board, skills training, and other preparatory modules during the summer before freshman year.

Voluntary Supports

Assistive technology. In recent years, scientific advancements have dramatically increased the type, quality, and affordability of sophisticated technological tools designed to meet the needs of students with learning difficulties. Many university offices of disability services loan out assistive technology, such as speech-recognition software, talking calculators, scanner/screen readers, and other assistive devices to qualified students (Sharpe, Johnson, Izzo, & Murray, 2005). For example, a device called a note-taking pen not only functions as an ink pen but also as an audio recorder for class lectures; after the audio files are transferred to the student's computer, the associated software links the audio recording to the student's handwritten notes. Assistive technology may be expensive and therefore not always available to students with disabilities who might benefit from it. The benefits of assistive devices are presumed and largely based on anecdotal reports rather than empirical evidence (Raskind & Higgins, 1998). Although the literature has abundant research on assistive technology as it relates to daily living skills (e.g. Bouck, Satsangi, Bartlett, & Weng, 2012; Bimbrahw, Boger, & Mihailidis, 2012), no research evaluating the effectiveness of current technologies as interventions for students with ADHD/LD could be found in peer-reviewed literature.

Learning strategy instruction. A second voluntary support for students with ADHD/LD involves instruction in developing learning strategies, an approach that has been extensively studied and widely accepted (Deshler & Lenz, 1989; Deshler & Schumaker, 1993). It holds that behaviorally based, targeted academic skills and strategic interventions are effective mechanisms for ameliorating the specific deficits of college students with LD (Holzer, Madaus, Bray, & Kehle, 2009). Learning strategy instruction assumes that students with learning difficulties can be taught how to use specific strategies to overcome their deficits and master cognitive learning skills (Deshler & Schumaker, 1993). The ultimate goal is for students to integrate the learning strategies into their self-instructional routine (Deshler & Lenz, 1989). Examples include strategies like *rehearsal* and *categorization* which strive to improve comprehension and recall of written text. The categorization strategy involves the student learning to identify important information by using clues in the text, such as headings, diagrams, or italics, and then making lists of that information to use as study notes in preparing for an exam (Deshler & Shumaker, 1993).

Learning strategy instruction has been used in a variety of educational settings and substantive areas, as well as with students of diverse ages and learning abilities (Hubner, Nuckles, & Renkl, 2010; Salamonson, Everett, Koch, Wilson, & Davidson, 2009). Other strategies that have been shown to improve academic outcomes for students with ADHD/LD focus on teaching organizational skills (LoSchiavo & Shatz, 2002), test-taking strategies (Holzer et al., 2009), and techniques to improve reading comprehension (Faggella-Luby, Schumaker, & Deshler, 2007). The efficacy of organizational skills training for younger students with ADHD was demonstrated in a recent controlled study

that found students who received the intervention not only showed significant improvements in several academic skills areas and higher GPAs, but these improvements persisted at the 8-week follow-up (Langberg, Epstein, Urbanowicz, Simon, & Graham, 2008). Similarly, a study using random assignment to investigate the effect of a learning strategy intervention on reading comprehension of younger students with ADHD/LD showed the treated students had statistically significant improvements in reading comprehension (Faggella-Luby et al., 2007); specifically, the randomized study showed a strong positive relationship (d = .776) between learning strategy instruction and subsequent reading comprehension.

Although the available evidence is limited, it appears that teaching test-taking strategies may be a more effective support for students with ADHD/LD than providing extended test time, which is the accommodation most frequently offered to students with disabilities (Lewandowski, Lovett, Codding, & Gordon, 2008; Ofiesh, Hughes, & Scott, 2004). Interventions that taught lower achieving students to use the strategies of their more successful peers reduced test anxiety (Holzer et al., 2009) and improved tests scores an average of 38 (out of 100) percentage points (Lancaster, Schumaker, Lancaster, & Deshler, 2009).

Coaching. Coaching involves a partnership between a coach and a client focused on attaining personal or professional goals (Kombarakaran, Yang, Baker, & Fernandes, 2008; Spence & Grant, 2007). Used in several settings, the most recent is university-based disability services for students with ADHD/LD (Swartz, Prevatt, & Proctor, 2005), where it seems to hold promise by helping students address deficits in executive functioning. For college students with ADHD/LD, coaching sessions are designed to

facilitate self-awareness and assist behavior change. Although considered complementary to psychotherapy, coaching is a distinct approach that focuses on overcoming challenges through developing pragmatic skills, including teaching students to become self-advocates, develop organizational skills for classwork, and develop social skills for living with a roommate.

With the recent explosion of coaching in multiple arenas, anecdotal evidence is abundant, but empirically-based literature remains very much in its infancy, especially as related to college students with ADHD/LD. The few published peer-reviewed investigations of coaching have been marked by substantial limitations, such as the lack of controlled studies and generalizable samples. In addition, the studies most frequently cited to demonstrate that coaching improves executive functioning, self-determination, and academic skills have primarily used case studies (Swartz et al., 2005), qualitative methods (Parker & Boutelle, 2009), and non-peer reviewed literature (Bettinger & Baker, 2011; Reaser, 2008). In fact, a recent meta-analysis could find only five empirical articles that evaluated any type of psychological/behavioral-based intervention for adults with ADHD (Weiss et al., 2008). Nonetheless, there appears to be consensus within the learning disabilities field that the promise of coaching warrants more rigorous evaluation to determine whether it is an effective intervention for assisting college students with ADHD and LD, and should be widely implemented (Grant & Cavanagh, 2007; Kilburg, 2004; Murphy, Ratey, Maynard, Sussman, & Wright, 2010).

Tutoring. Tutoring services have a long history of use among students of all ages. A landmark meta-analysis that considered more than 50 years of tutoring literature validated the effectiveness of academic tutoring (Jun, Ramirez, & Cumming, 2010;

Cohen, Kulik, & Kulik,1982). Indeed, the meta-analysis demonstrated that students who received tutoring services scored an average of 66% higher on exams than peers who were not tutored (Cohen et al., 1982). In addition, evaluations of tutoring programs have shown that tutoring improved college retention rates by as much as 19% (Reinheimer & McKenzie, 2011). In postsecondary educational settings, peer-led tutoring, a popular alternative method to instructor-led tutoring, has reportedly been shown to be an effective method of improving the academic performance of both the tutor and the person tutored (Coleman, Brown & Rivkin, 1997; Comfort, 2011; Hughes, Gillespie, & Kail, 2010). Although no data were available in this regard, research has established that compared to other materials, tutors better learn and absorb the material they teach their tutees (Roscoe & Chi, 2007). Specific to the population at hand, students diagnosed with ADHD/LD are thought be to improve in both academic performance and attentional behavior as a result of tutoring (DuPaul & Eckert, 1998; Vogel et al. 2007) but again, actual empirical data are lacking. Tutoring, especially peer-led tutoring, is a relatively inexpensive and simple method of providing academic assistance, as evidenced by its wide use; tutoring is offered to a variety of students at most universities and provided as a specific support for students with LD at nearly 70% of all U.S. colleges (Stodden, Whelley, Chang, & Harding, 2001; Vogel, Fresko, & Wertheim, 2007).

Support groups. Support groups are a popular intervention because the group format is considered effective and relatively inexpensive to form and maintain. Among other issues, support groups are frequently used to help participants address issues related to anxiety, depression, distress, confusion, unhealthy coping mechanisms, and phobias, with the overarching goal of helping them improve their quality of life, psychological

well-being, and social support (Spiegel, Bloom, & Yalom, 1981; Wang, Chien, & Lee, 2012). However, as seen with other popular approaches, the literature search conducted for this study yielded no peer-reviewed investigations that evaluated the effectiveness of support groups as an intervention for college students with ADHD/LD.

Some evidence exists showing that support groups with non-student adults with ADHD are effective in improving participants' self-efficacy, self-esteem, and disability-related knowledge (Bramham et al., 2009), and that support groups can be efficacious for college students in general (Mattanah et al., 2010). For example, Bramham et al. (2009), found that cognitive/behavioral group work reduced anxiety in adults with ADHD from 13 to 10 on the Hospital Anxiety and Depression Scale (p = .005), and in college, Mattanah et al., (2010) found that students were significantly less lonely if they were involved in a social support group compared to a control group (effect sizes = .35 and .53). Despite the popularity and anecdotal evidence of support groups as a useful and effective intervention, currently no strong evidence base exists to support the use of support groups for college students with ADHD/LD.

Summer transition programs. Colleges and universities across the country use summer transition programs for all types of students who might face difficulties making the transition from high-school to college. Some institutions offer these summer programs for incoming students who have ADHD/LD and who anticipate finding the transition troublesome. Services offered during transition programs for students with ADHD/LD often include skills training interventions, campus familiarity exercises, and discussions on what to expect in college. Some provide an opportunity for students to take one or more summer courses before the school year begins, allowing them to "test

the waters" to provide familiarity, comfort, and reassurance in their abilities to make the transition to college. However, despite fairly widespread use of these programs, no empirical evidence could be found in support of this intervention.

Discussion

The severe and damaging effects of ADHD/LD on the academic success of postsecondary students with these disorders have been well documented. Finding effective interventions to help students with ADHD/LD attain academic success is urgently needed given the growing numbers of college students with these disabilities. Such students are likely to suffer from an array of mental health disorders, self-image problems, and academic difficulties in conjunction with their ADHD/LD. Fortunately, U.S. law dictates that postsecondary educational institutions support these students by offering accommodations that ensure equal opportunity to achieve academically. However, university-based support programs are currently at a severe disadvantage to meet this goal because of the scarcity of empirical evidence available to guide both the implementation of existing supports as well as the development of new and perhaps more effective supports.

In response to this lack of evidence, this article presented a review of the peer-reviewed literature evaluating the efficacy of six support services that are optionally offered by university-based disability services on an optional basis to students with ADHD/LD. Overall, the study results indicate the field of disability services is moving toward greater reliance on EBP, but the current evidence base is inadequate. Only two of the six voluntary supports—learning strategy instruction and tutoring—have been tested and validated among students with ADHD/LD. Thus, it is recommended that that these

interventions, including both peer-led and instructor-led tutoring, continue to be used as support services for college students with ADHD/LD to increase college retention rates and improve academic outcomes.

Recommendations regarding the interventions that do not have evidence for their efficacy are more problematic. Although the coaching and support group interventions have not been validated with college-aged students with ADHD/LD, both interventions show promise of becoming substantiated practices. In particular, because support groups have proven efficacious with other populations, this approach of supporting college students with disabilities seems to have the potential for effecting positive outcomes. Similarly, the rapid emergence of coaching as an intervention has produced little empirical data, but there is an abundance of anecdotal evidence of the intervention's effectiveness of enhancing the college experience and academic success of students with disabilities, including ADHD/LD.

The two remaining voluntary interventions—assistive technology and summer transition programs—require substantially more research to determine whether these are effective interventions for students with ADHD/LD. Determining the effectiveness of these interventions is especially critical because these approaches are arguably the most expensive of the voluntary support programs. Without rigorous evaluation, it is impossible to know whether assistive technology and summer transitions improve the experiences of students with ADHD/LD or whether resources are being misdirected to these supports.

Clearly, an urgent need exists for evaluation of current best practices to improve outcomes for students with ADHD/LD at the postsecondary level. Intervention research

is the only mechanism that can close the gap between knowledge and practice, and the empirical evidence produced should ensure that the disability field can provide interventions that are efficacious to better serve students. It is incumbent upon the nation to enact policies to support equal access and equal opportunity in education for students with disabilities.

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PAPER II

DIAGNOSIS, SERVICE USE, AND ACADEMIC SUCCESS OF COLLEGE STUDENTS WITH ATTENTION DEFECIT HYPERACTIVITY DISORDER AND LEARNING DISABILITIES

Overview

Attention deficit hyperactivity disorder (ADHD) and the spectrum of learning disabilities (LD) are different and distinct neurological disorders that frequently co-occur and have similar symptoms. Students diagnosed with ADHD, LD, or comorbid ADHD and LD often face considerable academic and social difficulties that are intensified during the transition to college and throughout postsecondary studies (DuPaul, Weyandt, O'Dell, & Varejao, 2009). However, beyond research establishing this population as the largest and fastest growing group of students with disabilities in postsecondary educational settings (Orr & Hammig, 2009), little is known about this population's demographics, the accommodations and assistive services they need and use in college, and academic issues, such as graduation rate and grade point average (GPA). Consequently, service providers have scarce evidence to inform their development or implementation of programs intended to serve the needs of students with both disorders.

ADHD and LD are separate disorders that are diagnosed according to distinctly different criteria as set forth in the *Diagnostic and Statistical Manual of Mental Disorders-Text Revision* (*DSM-IV-TR*; American Psychiatric Association, 2000). Persons diagnosed with ADHD typically present with persistent patterns of inattention,

impulsivity, and hyperactivity. A diagnosis of LD is typically based on a significant discrepancy between a person's intelligence level and his or her academic achievement (American Psychiatric Association, 2000). The disorders are frequently diagnosed as comorbid conditions (Biederman, Faraone, Spencer, & Wilens, 1993; McGillivray & Baker, 2009), and sometimes treat these two disorders as a single group when investigating related issues.

ADHD and LD share many symptoms, including problems with inattention and hyperactivity, low tolerance for frustration, poor self-esteem, low morale, deficits in social skills, increased rates of school drop out, and poor vocational achievement (American Psychiatric Association, 2000). Students who suffer from one or both disabilities are likely to experience serious challenges at home, at work, at school, and in their social relationships (Reaser, Prevatt, Petscher, & Proctor, 2007). Despite frequent comorbidity and some parallel characteristics, these two diagnoses present distinct symptoms which may require distinct interventions. Further, it is not clear what effect a diagnosis of the comorbid condition has on the academic success of college students and whether the effect of the comorbid condition differs from single diagnoses of either disorder. Given that currently children are being diagnosed with both disorders over 45% of the time (DuPaul, Gormley, & Laracy, 2013), it is crucial that researchers and practitioners attend to the specific needs of this dually diagnosed group.

Many studies have supported the conclusion that a dual diagnosis of ADHD and LD puts youth at greater risk for academic failure and negative psychosocial outcomes that endure into adulthood (Sexton, Gelhorn, Bell, & Classi, 2002). Compared with youth who received a single diagnosis for either ADHD or LD, youth who received a dual

diagnosis for these disorders had worse academic outcomes (e.g. lower grades), (Faraone, Biederman, Monuteaux, Doyle, & Seidman, 2001). Indeed, although scant, available evidence supports the finding that receiving a dual diagnosis is predictive of negative academic outcomes (Faraone et al., 2001) and decreased levels of cognitive and neuropsychological functioning (Seidman et al., 2006; Jakobson & Kikas, 2007). This claim of predictive outcomes appears to be based on limited data related to standardized tests of cognitions and intelligence, such as the Wechsler Intelligence Scale for Children, and the Woodcock-Johnson Test of Cognitive Abilities. One study examined student success in passing college-level requirements for foreign language classes, and found no difference in academic success between students diagnosed with both disorders and those with a single diagnosis of either disability (Sparks, Javorsky, & Philips, 2005). Apart from that one study of college students, no other research was found that has replicated or refuted the pattern of negative academic outcomes found in children, in college-age students with comorbid ADHD and LD.

University offices for students with either single diagnoses or both disorders provide accommodations and supports for students who have documented diagnoses of these disabilities from a qualified health professional. *Accommodations* are legally mandated services that seek to assist students with ADHD and/or LD (ADHD/LD) by modifying certain academic environments (Ramsay, 2010). For example, accommodations include, extended test time, audio-recorded class lessons, and note taking services. Beyond accommodations, universities might offer these students other supports, such as coaching or support groups, to help students identify and work toward

personal goals, learn new academic skills, develop learning strategies, share their experiences, and normalize their disability.

To receive accommodations and often other supports, students must disclose their disability and register with the office of disability services. From here forward, this work will refer to *services* as both accommodations and mandated supports as a whole. However, not all students who register, return to the office to receive services. Differential use of disability services often creates three distinct groups of students eligible to receive services: students who never use services, students who use a single visit to take advantage of basic accommodations (accommodations students); and students who use services for at least two sessions. Sessions are often used to accomplish tasks such as a coaching meeting, learning strategy instruction, or a simple mechanism used to touch base.

Unfortunately, no information is currently available regarding the characteristics of students associated with these patterns of service use. Evidence showing whether service use has an effect on academic success among students with ADHD/LD could be valuable to administrators and service providers in planning efficient and effective services. For example, if an office of disability services could identify which students were most likely to register for but not use disability services—despite struggling academically—then the staff could not only remind those students of the help available but also investigate barriers to service use. Similarly, no information currently explains the variation in the extent to which students use services and what characteristics are associated with the distinct service-use groups. If data indicated a particular group was consistently eschewing services, then practitioners could conduct assessments to

understand better the needs of those students and modify service as needed to ensure efficient use of resources and meeting those students' needs. However, this potentially valuable information is not available. Unfortunately, it remains unknown if the different patterns of service use are associated with varying college success outcomes among students with ADHD/LD. Further, even basic data are unknown for this growing population of vulnerable students. These missing data include student characteristics such as gender, diagnosis, GPA, and descriptive data such as numbers of science, technology, engineering, and math (STEM) majors; enrollment rates of low income/full scholarship (a particular group of students who come from low income families and are given a complete full scholarship based on merit) students; numbers of athletes; and how many are transfer students.

The latter categories of descriptive characteristics (i.e., transfer students, STEM majors, low income/full scholarship students, and athletes) in and of themselves are often associated with poor academic outcomes, but data related to these groups are relatively scarce and sometimes unclear. Although data are contradictory, some evidence exists showing the graduation rate of transfer students is 10% to 24% lower than that of other students (Lorentz & Benedict, 1996; University of North Carolina General Administration, 2012). Graduation rates are even lower for STEM majors in general, who are about 60% less likely to graduate as compared with non-STEM majors, with rates even lower for minority groups (Tan, 2002; Whalen & Shelley, 2010). In fact, low-income students from disadvantaged families who receive full scholarships are a high risk group in and of themselves; they are less likely to graduate and more likely to have a lower GPA than the rest of the student body (University of North Carolina, 2012).

Finally, some evidence supports the conclusion that athletes graduate at lower rates than students who are not formal university athletes, with one national university reporting graduation rates of 73% for athletes as compared with 85% for the entire student body (Office of Institutional Research and Assessment, 2011). In contrast, the National Collegiate Athletic Association (2012) has asserted that athletes graduate at a rate that is two percentage points higher than the national average (65% vs. 63%). It remains unclear whether athletes are at a higher risk of not graduating than non-athletes. If transfer students, STEM majors, low income/full scholarship students, and athletes may be experiencing less academic success than their counterparts, it follows that having ADHD/LD in addition would impose compounding difficulties.

By examining characteristics of all ADHD/LD students, researchers can begin to fill the existing knowledge gap and provide practitioners with data to inform their design of support services. In addition, such examination should help clarify whether students diagnosed with ADHD, LD, or both are best served as separate groups or whether the same supports can be used effectively in offering one treatment approach for all three groups. Using a case study approach of all students approved for ADHD/LD support services at a major university, this study explored these unanswered questions. The primary objectives of this study were to (a) describe the characteristics, diagnoses, service-use patterns, and academic success of students approved for ADHD/LD services, (b) examine the relationships among these variables, and (c) compare students who received a dual diagnosis of comorbid ADHD/LD with students who received a single diagnosis of either ADHD or LD.

Method

Sample

The sample was comprised of 1,560 undergraduate students (both first-time freshmen and transfer) who entered the university between the fall semesters of 1980 and 2006; selecting these years allowed the data to contain only students who had at least 4 years of potential enrollment. Primary source data related to diagnosis and service use were located in a Microsoft Access database at the university's office for students with ADHD/LD. Service-use data were merged with data regarding student academic information and demographic characteristics provided by the university's Office for Institutional Research and Assessment. When necessary and possible, missing information related to diagnoses and service use was retrieved from hard copies of records in the university files.

Variables

Demographic data included gender, race/ethnicity, diagnosis (ADHD, LD, or both) and status at entry (transfer or first-time freshman). Data also were abstracted whether students were STEM majors, low income/full scholarship, and/or athletes. Declaring oneself as a STEM major did not constitute an official classification of being a STEM major; a student had to graduate with that major to be considered a STEM major. *High school variables* included SAT scores (verbal and math), high school GPA, and high school rank (percentile). *Diagnosis* required medical documentation that an individual has ADHD, LD, or both. *Service use* included *type of use* (none, one accommodations approval visit, or two or more sessions with a learning specialist) and

for those who had at least one visit, the *amount of service use* measured by number of sessions held with an ADHD/LD learning specialist.

Academic success included cumulative GPA, graduation, time-to-graduation, and three special academic circumstances: academic withdrawals, academic ineligibilities, and course underloads. An academic withdrawal occurs when a student formally leaves the university and drops all classes. If students do not maintain a satisfactory GPA (>1.99) and subsequently do not complete the required interventions, they become academically ineligible and are barred from registering for classes. A course underload occurs when an undergraduate student enrolls in 9-11 credit hours rather than a minimum of 12, and may be granted to students who show cause.

Data Analysis

All descriptive and comparative analyses were performed using StataIC 12 (StataCorp, 2011). Descriptive statistics were used to compare means and characterize the sample with respect to student characteristics, diagnosis, service use, and academic success variables. To build the multivariate model, all variables must have had bivariate associations with the dependent variable at a p-value of ≤ 0.20. Bivariate analyses were chi-squares, t-tests, ANOVAs, or linear regression models depending on the structure of the variable. Five models were evaluated using linear regression, logistic regression, and multi-nomial logistic regression to examine the relationships among the variables listed above that showed the appropriate significance level of ≤ 0.20, and to investigate how having a diagnosis of comorbid ADHD/LD differs from a single diagnosis of ADHD or LD. The STEM major and time-to-graduate variables could not be included in the models given their perfect correlations with graduation. Missing data ranged from zero in

Race/Ethnicity variables to 30% in type of service use. Multiple imputation was used in all multivariate analyses to account for missing data and model fit statistics were evaluated. *Diagnosis* was defined as ADHD-only or LD-only except in the model comparing students with dual diagnoses to those with single disorder diagnoses.

Results

Descriptive Analyses

The majority of the sample was White (83%; *n* = 1,299), and male (59%; *n* = 914). Nearly three quarters (73%; *n* = 1,134) of students were first-time freshmen (Table 1). Across all students registered for services, just over 9% (*n* = 147) graduated with a STEM major; 2% (*n* = 34) were full scholarship/low income; and 9% (*n* = 133) were athletes. The sample high-school GPAs averaged 3.6 on a 4-point scale (*SD* = .7) and the mean high school rank was 57th percentile (*Mdn* = 71; *SD* = 36); a student with a rank in the 57th percentile has a higher GPA than 57% of his or her class. Average SAT scores were 564 out of a possible 800 (*SD* = 110) in verbal and a slightly better 592 points (*SD* = 105) out of 800 in math.

Diagnosis. University records contained a diagnosis for 95% (*n* = 1,484) of the sample; the paperwork recording the diagnosis for the remaining 5% was lost in the transition from hard copy to electronic records. Among the 1,484 students for whom a diagnosis was available, 39% (*n* = 575) were diagnosed with ADHD, 36% (*n* = 535) were diagnosed with LD, and 25% (*n* = 374) were diagnosed with both (See Figure 1). Among the separate diagnostic groups, females constituted less than half of students with ADHD (46%; *n* = 266), LD (38%; *n* = 203), and both (40%; *n* = 150), (percentages not shown in table). Bivariate analyses revealed that compared to LD, students with ADHD had higher

verbal ($p < .001$) and math ($p < .001$) SAT scores, high school GPAs (3.7 vs. 3.5, $p < .001$), and high school rank (59 vs. 54, $p < .04$) but then in college they had more withdrawals ($p < .001$), ineligibilities ($p < .001$), and underloads ($p < .001$). Low income/full scholarship students and athletes were more likely to be diagnosed with both ADHD and LD than only one disorder ($p < .001$, for both).

Service use. Although nearly 30% ($n = 282$) of students approved for disability services registered for but never returned for services and 4% ($n = 43$) returned only once to sign up for accommodations, the majority of students chose to return for services at least twice (67%, $n = 661$). Of the three groups based on disability diagnosis, the students with a dual diagnosis of ADHD and LD were the group most likely to return for repeated service visits (74%, $n = 227$) followed by the ADHD-only group (67%, $n = 256$), and then the LD-only group (59%, $n = 170$; See Table 2 and Figure 1). Among the majority of students who returned for repeated sessions of service use, the number varied drastically, ranging from 1 to 94 visits, with an average of 11 visits ($SD = 10$). Most students returned for services eight or fewer times and about 10% returned more than 22 times. Accommodations students took significantly longer to graduate than students who never used and those who used services continually (5.6 vs. 4.6 & 4.5, $p<.01$).

Academic Success. In all, 1,229 (79%) of the 1,560 students in the study sample graduated from the university, with 4 years considered the minimum time-to-graduation. Sampled students took an average of 4.5 years ($SD = 1.8$) to graduate; however, some students included in the study dataset had only the 4-year minimum in which to graduate. Among the students who graduated, 59% ($n = 719$) did so within 4 years and 92% ($n = 1,113$) did so within 6 years. Overall, 16% ($n = 255$) of students withdrew from school at

least one time, 20% (*n* = 307) had academic ineligibility status at least once, and 11% (*n* = 170) received permission to carry a course underload sometime during their college tenure. The average cumulative GPA was 2.7 (*SD* = .6), which was a 1-point drop from the sample's high-school GPA of 3.7.

Table 1
Descriptive Statistics of Students Approved for ADHD/LD Services, by Diagnosis (N=1560)[a]

Characteristics	Total Sample	ADHD	LD	*p* value	Both	One Dx	*p* value
		N (%) or *M* (*SD*)			*N* (%) or *M* (*SD*)		
Total	1,560 (100)	575 (52)	535 (48)		374 (25)	1,110 (75)	
Gender							
Male	914 (59)	309 (48)	332 (52)	0.01	224 (25)	641 (75)	0.52
Female	646 (41)	266 (57)	203 (43)		150 (24)	469 (76)	
Race/Ethnicity							
White	1,299 (83)	497 (52)	452 (48)	0.36	283 (22)	949 (78)	<.001
Black	168 (11)	36 (36)	64 (64)	<.001	60 (36)	100 (64)	<.001
Hispanic	31 (2)	14 (67)	7 (33)	0.17	10 (32)	21 (68)	0.30
Asian/Pac	21 (2)	13 (76)	4 (24)	0.04	4 (19)	17 (81)	0.57
Other	41 (3)	7 (64)	4 (36)	0.43	8 (42)	11 (58)	0.07
Student Type							
First-time freshman	1,134 (73)	431 (54)	368 (46)	0.42	290 (26)	799 (74)	0.92
Transfer	220 (27)	76 (50)	75 (50)		55 (26)	151 (74)	
Other Student Characteristics							
STEM major1	47 (9)	57 (52)	55 (48)	0.95	34 (23)	110 (77)	0.79
Low Income/							
Full Scholarship	34 (2)	11 (69)	5 (31)	0.17	18 (53)	16 (47)	<.001
Athlete	133 (9)	17 (31)	38 (69)	<.001	78 (59)	55 (41)	<.001
High School							
SATV	564 (110)	598 (100)	536 (113)	<.001	570 (99)	564 (112)	0.39
SATM	592 (105)	621 (92)	574 (113)	<.001	586 (97)	595 (107)	0.16
GPA	3.6 (0.7)	3.7 (0.6)	3.5 (0.7)	<.001	3.5 (0.7)	3.6 (0.7)	0.05
Rank (percentile)	57 (36)	59 (37)	54 (36)	0.04	56 (35)	57 (37)	0.88
Type of Service Use							
None	282 (29)	109 (51)	105 (49)	0.04	63 (22)	219 (78)	
<.001							
Accommodations	43 (4)	14 (52)	13 (48)	0.60	15 (35)	28 (65)	0.58
Continued Use	661 (67)	256 (60)	170 (40)	0.02	227 (35)	431 (65)	<.001
Amount of Service Use	10.8 (10.4)	11.1 (10.1)	10.8 (9.9)	0.78	10.1 (9.8)	11.2 (10.7)	0.22
Graduation							
Graduated	1,229 (79)	452 (52)	425 (48)	0.73	295 (24)	877 (76)	0.94
Did not graduate	331 (21)	123 (53)	110 (47)	79 (24)	233 (76)		
Years to Graduation	4.5 (1.8)	4.6 (1.8)	4.5 (1.8)	0.13	4.5 (1.7)	4.6 (1.8)	0.76
Grade Point Average							
Cumulative GPA	2.7 (0.6)	2.7 (0.6)	2.7 (0.6)	0.70	2.7 (0.6)	2.7 (0.6)	0.08
Special Academic Circumstances							
Withdrawals	255 (16)	139 (74)	49 (26)	<.001	63 (25)	191 (75)	0.86
Ineligibilities	307 (20)	124 (62)	77 (38)	<.001	103 (34)	203 (66)	<.001
Underloads	170 (11)	84 (68)	39 (34)	<.001	45 (26)	125 (74)	0.50

[a]Data are from students with entry years that range from 1980-2006
Missing data ranged from zero in race/ethnicity variables to 30% in type of service use variables

Table 2

Descriptive Statistics of Students Approved for ADHD/LD Services, by Service Use and Graduation (N=1560)

Characteristics	Type of Service Use				Amount of Use		Graduation		
	None	Accommodations	Continued	*p*-value	N° of Sessions	*p*-value	Yes	No	*p*-value
	N (%) or Mean (SD)				*N* (%) or Mean (SD)		*N* (%) or Mean (SD)		
Total	82 (29)	43 (4)	661 (67)		11 (10)		1,229 (79)	331 (21)	
Gender									
Male	169 (30)	31 (5)	368 (65)	0.07	10 (10)	0.10	700 (77)	214 (23)	0.00
Female	137 (24)	12 (3)	293 (70)		12 (11)		529 (82)	117 (18)	
Race/Ethnicity									
White	245 (31)	33 (4)	521 (65)	0.01	11 (10)	0.42	1,058 (81)	241 (19)	0.00
Black	27 (24)	5 (4)	82 (72)	0.46	9 (9)	0.03	104 (62)	64 (38)	0.00
Hispanic	2 (7)	1 (4)	25 (89)	0.03	15 (15)	0.07	20 (65)	11 (35)	0.55
Asian/Pac Islander	1 (8)	1 (8)	11 (85)	0.59	11 (9)	0.95	17 (81)	4 (19)	0.06
Other	3 (18)	1 (6)	13 (76)	0.59	14 (18)	0.20	14 (74)	5 (26)	0.16
Diagnosis									
ADHD Only	109 (28)	14 (4)	256 (68)	0.08	11 (10)	0.78	452 (79)	123 (21)	0.92
LD Only	105 (36)	13 (5)	170 (59)		11 (10)		425 (79)	110 (21)	0.68
Both ADHD & LD	63 (21)	15 (5)	227 (74)	<.001	10 (10)	0.22	295 (79)	79 (21)	0.94
Either ADHD or LD	219 (32)	28 (4)	431 (64)		11 (11)		877 (79)	233 (21)	
Student Type									
First-time freshmen	225 (29)	31 (4)	510 (67)	0.33	11 (10)	0.48	918 (81)	216 (19)	0.56
Transfer	30 (24)	4 (3)	93 (73)		12 (13)		192 (87)	28 (13)	
Other Student Characteristics									
STEM major	30 (28)	7 (7)	70 (65)	0.25	12 (12)	0.27			
Low Income	1 (3)	3 (9)	30 (88)	<.001	9 (6)	0.32	21 (62)	13 (38)	0.01
Full Scholarship									
Athlete	23 (17)	6 (5)	104 (78)	0.01	8 (6)	<.001	99 (74)	34 (26)	0.00
High School									
SATV	574 (100)	575 (113)	599 (99)	<.01	11 (11)	<.01	565 (108)	557 (117)	0.00
SATM	597 (98)	591 (109)	619 (96)	<.01	9 (6)	0.01	595 (101)	577 (117)	0.00
GPA	3.6 (0.7)	3.6 (0.8)	3.7 (0.6)	0.04	10 (7)	0.47	3.7 (0.6)	3.4 (0.8)	0.00
Rank (percentile)	63 (33)	51 (40)	53 (39)	<.001	9 (10)	<.001	58 (36)	52 (36)	0.00
Type of Service Use									
None							217 (77)	65 (23)	0.29
Accommodations only							30 (70)	13 (30)	0.12
Continued use							533 (81)	128 (19)	0.09
Amount of Service Use							10.7 (10.2)	7.1 (9.3)	0.37
Graduation									
Graduated	217 (28)	30 (4)	533 (68)	0.14	11 (10)	0.37			
Did not graduate	65 (32)	13 (6)	128 (62)		10 (11)				
Years to Graduation	4.6 (1.5)	5.6 (3.9)	4.5 (1.8)	<.01	5.5 (5)	<.001			
Grade Point Average									
Cumulative GPA	2.7 (0.6)	2.6 (0.8)	2.8 (0.6)	0.19	11 (9)	0.12	2.9 (0.5)	2.1 (0.7)	0.00
Special Academic Circumstances									
Withdrawals	50 (25)	11 (6)	138 (69)	0.36	10 (9)	0.14	140 (55)	115 (45)	0.00
Ineligibilities	65 (31)	13 (6)	135 (63)	0.25	9 (9)	0.04	187 (61)	120 (39)	0.00
Underloads	27 (21)	10 (8)	93 (72)	0.02	9 (10)	0.02	86 (51)	84 (49)	0.00

[a]Data are from students with entry years ranging from 1980 to-2006

Relationship of Student Demographics and Characteristics to Diagnosis, Service Use and Academic Success

Multivariate modeling indicated that neither diagnosis nor service use variables were significantly related to graduation. However, in relation to the other dependent variables, several significant findings emerged. As shown in Table 3, when compared with students with an LD-only diagnosis, students with ADHD-only diagnosis were 30% more likely to have been ineligible (exp(β)=1.30, $p < .012$) and were 66% more likely to withdraw from school (exp(β)=1.66, $p < .001$).

Table 3
Significant Adjusted Covariates of Diagnoses and Amount of Use

	ADHD vs. LD			Amount of Use			Both vs. Either		
	Coef (OR)	*p*-value	95% CI	Coef	*p*-value	95% CI	Coef (OR)	*p*-value	95% CI
GPA	[a]			1.76	0.027*	0.20 - 3.32	-0.09 (0.91)	0.70	-0.54 – 0.36
Withdrawals	0.51(1.66)	<.001***	0.20 - 0.81	0.05	0.93	-1.06 - 1.15	[a]		
Ineligibilities	0.26 (1.30)	0.012*	0.06 - 0.47	-0.13	0.78	-1.06 - 0.79	0.19 (1.21)	0.46	-0.32 – 0.70
Continued vs no use	-0.29 (0.75)	0.13	-.66 – 0.08	[a]			-0.66 (0.52)	0.002**	-1.07 - -0.25

GPA: Grade point average
[a]Not included in the model based on bivariate relationship significance level (higher than 0.2)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The analysis of students' amount of service use revealed that those with higher GPAs were likely to have had more service contacts with learning specialists. For example, every one unit increase in GPA was associated with an almost two-unit increase in the average number of service/support sessions a student attended (b = 1.76, $p < .027$). Finally, one significant finding emerged from the analysis examining differences between students dually diagnosed with ADHD and LD and those with a single diagnosis of either disorder. Compared with those who registered and never returned for services, students who used services two or more times were twice as likely to be dually diagnosed with ADHD/LD (exp(β)=.52, $p < .002$).

Analyses of type of service use (Table 4) showed that as compared with females, males were more 3 times as likely to be a one-time user of services (i.e., to arrange accommodations) than to use services continually (0.73 vs. 0.76, $p < .02$). However, Black students displayed a pattern of service use that was opposite that of students who were White or other race/ethnicities. Black students were much less likely to be a one-time user of services (i.e., to arrange accommodations) than continued-use students (0.00 vs. 0.02, $p < .013$). Across all student categories, athletes were most likely to engage in continued use of services and the least likely to register for and never return for services (0.89 vs. 0.73, $p < .005$).

Table 4

Significant Adjusted Predicted Probabilities of Type of Service Use: Student Characteristics

	None	Accommodations Only	Continued Use
Gender			
Male	0.24	0.03[a]	0.73[a]
Female	0.23	0.01[a]	0.76[a]
Race			
Black	0.28	0.00[b]	0.72[b]
Non-Black	0.23	0.02[b]	0.75[b]
Athletic Involvement			
Athlete	0.09[c]	0.02	0.89[c]
Non-athlete	0.25[c]	0.03	0.73[c]

[a]Significantly different predicted probability of the difference by gender between none and continued use (p=.016)
[b]Significantly different predicated probability of the difference by race between continued use and none (p=.013)
[c]Significantly different predicted probability of the difference by athlete between continued use and none (p<.01)

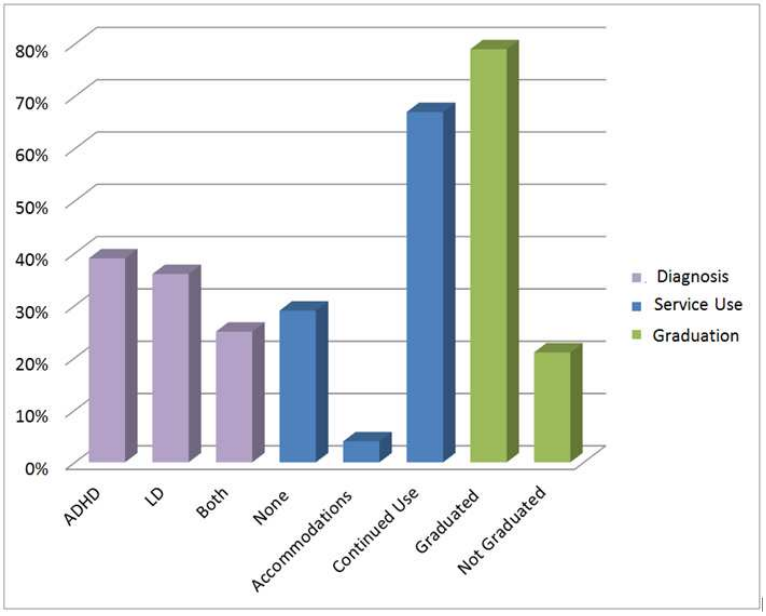

Figure 1. Distribution of diagnosis, type of service use, and graduation, among students presenting for services (n=1,560).

Discussion

A large and growing group of students diagnosed with ADHD and LD face academic and social difficulties that are exacerbated with the transition from the relatively protected high-school setting to the more independent, less-structured environment of the college or university campus. Despite the increasing college enrollment of students with ADHD/LD, little is known about this population related to demographics, diagnoses, service use, and academic success. This study begins to fill this expansive knowledge gap by describing students approved for services at one university office for disability/support services and by examining the relationships among these variables. Descriptive analyses uncovered three particularly noteworthy outcomes. First, the average cumulative student GPAs declined substantially from high school to college, with an almost 1-point drop in GPA. Second, although the majority of students who registered for services were likely to return for repeated visits, 30% of students never returned. Moreover, a small group of students' contact with disability services was limited

to a one-time visit to arrange accommodations. Third, it takes students diagnosed with both ADHD and LD an average of nine semesters to graduate, compared with students with a single diagnosis of either ADHD or LD and accommodations students require an average of one year longer than other ADHD/LD students.

These data showed that among students approved for ADHD/LD services, high school GPAs averaged 3.66, a value that was likely considered above average; students with this GPA would have received almost all As and would not be at high risk for failing classes or dropping out. However, the average cumulative college GPA of the sampled students was 2.71, a value that indicated C and B grades. A 2.71 GPA is considered average, and as compared with students whose GPA is above average, a student with an average GPA would be at increased risk for academic probation, for becoming ineligible, and perhaps more likely to drop out of school because a poor grade in one class could pull down the GPA and trigger special academic circumstances.

In this sample, the change in average GPA from high school to college was a decrease of about one point, whereas the typical change in GPA for most college students reflects a decrease closer to one half of a percentage point from their high-school GPA (Belfield & Crosta, 2011; Kobrin & Patterson, 2011). The notable drop in GPA for ADHD/LD students from high school to college likely reflects the difficulties these students might have encountered transitioning from the more structured, protected high-school environment to the college environment that has greater freedom but also demands greater executive functioning, which is a particular challenge among students with ADHD/LD. Many young people with ADHD/LD depend upon their parents and school personnel to be their advocates, to provide daily structure, and keep them on track;

the independence and responsibilities suddenly gained in college can be overwhelming, leading to academic, social and emotional difficulties (Skinner & Lindstrom, 2003).

Although the lower college GPA could simply mean the college-level work is harder as reflected in lower grades, it could indicate these students have experienced difficulty in making the transition to the college learning environment, or a combination of both. Determining the true indication of the lower GPA is important because a difficult college transition and lower grades could mean these students are also suffering declines in self-image as a result. This outcome confirms the importance of transition programs or other college-based interventions and individualized planning while the student is still in high school. Further research in this area could elucidate reasons behind the achievement decline and lead to interventions that could mitigate the problem.

Service-use patterns found in this sample are clear; most students who seek out services by disclosing their disability status followed through and attended at least two sessions with a learning specialist. Surprisingly, only a small percentage of students were one-time users who came in solely to arrange accommodations. However, perhaps the most mystifying pattern was that of 468 students (30%) who self-disclosed their disability status, completed the support services registration process, were approved for services, chose never to return for those services. This finding raises questions regarding the students' circumstances once they have matriculated and begun to settle in the college setting. Students who never return for services either do well without assistance or struggle academically and/or socially, with some perhaps eventually withdrawing from school.

In this sample, it appears that students who never return for services fared almost as well as the rest of the sample. Comparisons indicate that the group of students who did not use

support services had an average GPA identical to the remainder of the sample (2.7 for both groups), a similar number of withdrawals (18% vs. 16%), graduated at similar rates (77% vs. 79%), and took about the same time to graduate (4.6 years vs. 4.5 years). Given that the non-users do not seem to be at increased risk for academic difficulties, it may be that these students obtained approval for support services as a type of "safety net," whereas the students who self-select to use services had a higher level of need. It is also possible that there was no difference between students who did not use services and those who did because the services themselves do not improve college success. While additional research it is required to test these hypotheses, there is some evidence that many services offered to college students with ADHD/LD are indeed effective (Richman, 2013, in preparation).

Unfortunately, the data did not indicate what types of support services the sampled students had received during their high-school years. It would be interesting to know if the group of non-users had received coaching and learning strategy instruction in high school that they could apply without further help in their college learning environment. Further, having knowledge regarding the severity of disabilities and at what age the student was diagnosed could offer further insight into driving forces behind service use. Future research exploring these areas and using qualitative methods to obtain a more in-depth and detailed understanding as to why students choose whether or not to take advantage of services would help explain these results.

Observing time-to-graduate patterns also yielded interesting results. Among first-time freshmen *who graduated*, 55% did so within 4 years and another 32% graduated given one additional year, an increase of 32%. In all, 94% of students who graduated achieved this goal within 6 years of enrollment. Based on this sample, many students approved for ADHD/LD services will take more than eight semesters to graduate, in fact, ADHD/LD students generally

take at least one and often two semesters longer to graduate than non-disabled peers (Jorgensen et al., 2003; Vogel & Adelman, 1992). Further, an unexpected outcome revealed that accommodations students took significantly longer (an average of one year) to graduate than all other ADHD/LD students. It is not understood why students who did not use services and those who use at least twice graduate faster, it could imply that students who use only accommodations would benefit from more comprehensive assistance like getting help from learning specialist.

These findings related to time-to-graduation have considerable implications for individuals with these disabilities, their families, and schools. Knowing ahead of time that a student with ADHD/LD is at risk of taking longer than four years to complete the requirements for an undergraduate degree, these students can work more diligently to ensure they finish on time, or be prepared to stay a little longer. Awareness of the risk of delayed graduation might be the incentive some students need to pursue the support services that could help them stay on track. Either way, understanding that students with ADHD/LD have a high likelihood of needing more than eight semesters to complete a college degree can better help students prepare cognitively, emotionally, and financially for the commitment ahead. Note that if the dataset had included additional subsequent years, graduation rate in this sample would likely increase since so many students take extra time to graduate.

Comparative Analyses: Relationships Among Student Characteristics, Diagnosis, Service Use and Academic Success

The regression analyses resulted in four primary findings. First, students with ADHD are likely to require more withdrawals, ineligibilities, and underloads during their college tenure than those with LD. Second, patterns of service use varied according to race/ethnicity, gender, and status as a student athlete. Third, students who made better grades tended to have a higher

number of service contacts than lower achieving students. Fourth, compared with those who registered for but never used services, students who used services two or more times were twice as likely to be dually diagnosed with ADHD and LD.

Although students with ADHD-only or LD-only diagnoses and those dually diagnosed are typically served in the same college-based offices and offered the same array of support services, it is unknown how these students might differ from one another apart from their formal diagnoses. The expectation was to find that more characteristics, service use patterns, and academic success would vary according to diagnosis, but the only significant findings were that ADHD students were more likely to withdraw from school and become ineligible than their LD counterparts. Such findings might suggest that students with ADHD experience more academic and socio-emotional difficulties overall than those with LD. In a separate post hoc analysis and in the interest of discovering if withdrawals and ineligibilities were linked to graduation rates, it was discovered that the likelihood of graduating was significantly lower for students with one or more withdrawal events ($p < 0.0001$) and one or more periods of academic ineligibility ($p < 0.0001$). It is in the best interest of learning specialists, academic advisors, and other school personnel to recognize that students with ADHD are more likely to experience these special academic circumstances, which could put students at increased risk for not graduating. Therefore, these professionals should meet with students diagnosed with ADHD to discuss their risks and academic trajectory.

In an effort to address the substantial gap in information related to how and to what extent students use ADHD/LD support services in college, this study examined service use patterns. Although type and amount of service use were not significantly related to academic success variables, some interesting outcomes were revealed. Males tended to be one-time service

users that arranged for accommodations but did not use other support services. In contrast, Black students, similar to student athletes, were most likely to use services consistently.

The reasons remain unknown for the variation in service-use patterns according to race gender and athlete status. As one might expect, athletes were less likely to use services overall, which may be related to the supplementary academic supports to which student athletes are entitled because of their demanding team schedules. Those supplementary supports could have been acting as a substitute for ADHD/LD services. However, because athletes were likely to use services continually rather than become "accommodations-only" students, perhaps they found the assistance and relationship established over time with a learning specialist trained to address challenge of ADHD/LD to be more beneficial than other supports that were not specific to these disorders.

This study also found a significant relationship between a students' increased number of service contacts with learning specialists and a higher cumulative GPA. The cross-sectional nature of these data did not allow for causal inference; thus, either students with better grades were more likely to persist in pursuing support services or students who had more contact with a learning specialist were more likely to receive better grades. Either way, higher achieving students are more likely to persist in their help-seeing behaviors.

Because so little is known about college students dually diagnosed with ADHD/LD, this research sought to clarify differences between this group and students with single diagnoses of ADHD or LD. Although it was anticipated that a diagnosis of both would be related to academic success, the only significant difference that emerged between diagnostic types was related to type of service use: compared with students who never used disability services, students who returned two or more times were twice as likely to have a dual diagnosis of ADHD/LD. This

finding implies that individuals with compounding difficulties are choosing to seek elevated levels of assistance.

Despite high school rank and SAT scores being significantly related to some of the dependent variables, in each case, the difference was too small to be meaningful and was perhaps found significant only due to the large sample size.

Limitations and Future Research

The present study had some limitations that must be considered to adequately understand the findings presented. First, although these data represented a single university, and therefore, the findings are not generalizable, the sample was sizable and drawn from a large public university. Second, ideally this study would have been conducted using a control group design; however, that design was not feasible. Finding a control group is not easy given that college students are not required to disclose any disability to their schools, and therefore, all service use is determined by self-selection. Given that nationally, only 24% of college students who are identified as having a disability in high school go on to receive any disability-related services in their postsecondary schools (Newman, et al., 2011), there are certainly students not included in this sample who were either undiagnosed or chose not to access services.

Third, this study was limited because it could not determine the extent to which accommodations (or other outside services) were used by the sampled students, which would tell a more complete story. Fourth, Students who entered the university before and after the American's with Disabilities Act (ADA) of 1990 was passed were included in this sample. The landmark legislation ensured that students with ADHD/LD had access to postsecondary education (Allsopp, Minskoff, & Bolt, 2005), but implications related to the ADA were not examined. Last, some of the electronic records for students in this dataset were incomplete.

When possible, missing data were retrieved from the hard copies of documents that the university had retained; nevertheless, a few variables had a larger proportion of missing data. For example, the variable *amount of service use* was missing 30% of possible cases and, despite the use of multiple imputation to account for missing data, models with fewer missing cases would have been more ideal. However, even taken together, these limitations do not lessen the importance of the outcomes found in this work.

Given the little available knowledge about college students with ADHD/LD, this study has established an important foundation for future research on the success of college students with these disabilities as well as best practices in service delivery. For the first time in peer-reviewed literature, this study has reported the demographics, diagnoses, type and amount of service use, graduation rates, and other variables for a large sample of college students with ADHD/LD. Further, this work indicates that future research should address issues surrounding ADHD/LD students requiring increased number of semesters to graduate, how to help students cope with and potentially raise their college GPAs to levels comparable to the rest of the student body, possible barriers to service use, varying extents of service use, and the relationship of increased service use to higher grades.

Determining which services are most efficacious for various students and discovering why some students choose to seek help while others do not are areas of inquiry that have the potential to improve service delivery greatly. The problems in understanding the college experience of students with ADHD/LD are made more difficult by the scarcity of data available regarding this growing and vulnerable population of students. Therefore, it is imperative for all college-based support services offices providing services to students with single or dual

diagnoses of ADHD and LD to document and report these students' amount of service use, their characteristics, and their academic success.

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PAPER III

THE SUCCESS OF STUDENTS WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER AND LEARNING DISABILITIES IN COLLEGE

Overview

College students diagnosed with attention deficit/hyperactivity disorder (ADHD), learning disabilities (LD), or both ADHD and LD, are likely to struggle with academic and social issues while pursuing their postsecondary educational goals (Gregg, 2007; Heiman, & Precel, 2003; Weyandt & DuPual, 2008). Despite this consistent finding, data on the academic success of this group of students are surprisingly limited, especially given that the percentage of college students reporting ADHD and/or LD (ADHD/LD) has grown considerably in the recent past (Orr & Hammig, 2009). The scarcity of data on the growing population of students with ADHD/LD disabilities is underscored by the absence of any indication that postsecondary institutions are monitoring the academic success of these students through measures such as grade point average (GPA), graduation rates, or time-to-graduate; that said, if institutions are monitoring these measures, it does not appear that they are releasing the aggregate data. In addition, information related to special academic circumstances such academic withdrawals (i.e., formally defined as withdrawing from school and dropping all classes), academic ineligibilities (i.e., being prohibited from registering for classes based on performance), or course underloads (i.e., allowing students to take fewer classes than is regularly permissible), is nonexistent in the peer-reviewed literature.

Although ADHD and LD are distinct disorders, they have many similar symptoms. Students who present with either disability are likely to experience problems associated with

inattention, hyperactivity, low self-esteem, social skill deficits, and increased school dropout rates (American Psychiatric Association, 2000). Both types of students report substantial difficulties in the areas of time management, information processing, concentration, motivation, and anxiety control (Reaser, Prevatt, Petscher, & Proctor, 2007). Moreover, ADHD and LD frequently co-occur and are diagnosed as comorbid conditions. Although specific data for the college population is unavailable, a recent meta-analysis of 17 studies conducted since 2001 revealed that among students who have one disorder, 45% have both disorders (DuPaul, Gormley, & Laracy, 2013). Living with ADHD/LD is further complicated by other co-occurring conditions; of note, rates of depression and depression-related symptoms are especially high with reported prevalence rates ranging from 40% to 86% (McGillivray & Baker, 2009). Further, adults with ADHD are shown to have increased levels of oppositional, conduct, and substance abuse and anxiety disorders (Murphy & Barkley, 1996; Biderman, Faraone, Spencer, & Wilens, 1993).

The transition from high school to college is a difficult time for many students, but students with ADHD/LD in particular tend to experience severe setbacks during this vulnerable period (Meaux, Green, & Broussard, 2009). Moving from high school to college successfully is important because the majority of college attrition occurs during the first year (Carruthers, Fox, Murray, & Thacker, 2012; Tinto, 1998). After matriculating, college students are flooded with increased responsibility and independence, and students with ADHD/LD are often unprepared for the rapid adjustments required during this transition (Meaux, Green, & Broussard, 2009). The sudden loss of structure previously imposed by parents or provided by high-school personnel allows new freedoms that students with ADHD/LD can find difficult to navigate (Farrell, 2003). For students with ADHD/LD, making poor decisions while learning to advocate for themselves

and encountering myriad unfamiliar or unexpected situations can often lead to academic failure, risky health behaviors, and decreased quality of life (Farrell, 2003). In addition, stigma related to these disabilities remains prevalent, contributing to the academic hurdles and emotional harm experienced by these students (Canu, Newman, Morrow, & Pope, 2008; Yu, Zhang & Yan, 2005).

As a result of the enactment of the American's with Disabilities Act of 1990 (ADA), which ensured that students with ADHD/LD had access to opportunities for postsecondary education, colleges and universities reported an influx of enrollment (Allsopp, Minskoff, & Bolt, 2005). The actual proportion of students with ADHD/LD enrolled in college is unknown, primarily because students are not required to disclose their disability or diagnosis to their institution (DuPaul, Weyandt, O'Dell, & Varejao, 2009). In fact, nationally, only 24% of students who are identified as having a disability in high school are likely to receive disability-related services in college (Newman, et al., 2011), However, the available information confirms that between 9% and 11% of U.S. college students identify as having a disability, and of these, the largest and fastest growing group are students with ADHD/LD (Orr & Hammig, 2009). Similarly, students with LD followed by those with ADHD constitute the two largest groups of postsecondary students served by offices for students with disabilities (Harbour, 2004).

Students with LD are about half as likely to enroll in college than peers without LD (Wagner, Newman, Cameto, Garza, & Levine, 2005). Information related to ADHD college prevalence rates however, is not clear. Scholars have attempted to compensate for the paucity of information by estimating ADHD college prevalence rates based on reports of clinically significant levels of symptoms that students present. A meta-analysis examining studies of this

nature reported that students with ADHD represent between 2% and 8% of all college students (DuPaul et al., 2009).

Students with disabilities experience less academic success than those without disabilities (Heiman & Precel, 2003; Milsom & Hartley, 2005; Murray, Goldstein, Nourse, & Edgar, 2000). Those with ADHD/LD are more likely to have lower GPAs than their nondisabled peers, with an estimated average GPA of 2.5 as compared with 3.2 among nondisabled peers (Blasé et al., 2009; Frazier, Youngstrom, Glutting, & Watkins 2007; Vogel & Adelman, 1990). The lower GPA among students with ADHD/LD might explain, at least in part, the increased rates of academic probation among this group (Heiligenstei, Guenther, Levy, Savino, & Fulwiler, 1999).

The National Center for Education Statistics (NCES; 2009) confirms that students with ADHD/LD are less likely to finish postsecondary education than their counterparts without disability challenges (Frazier et al., 2007). While data pertaining to graduation rates of this group are limited, estimates indicate that 53% of students with disabilities graduate from college compared with 64% of all students (Horn, Berktold, & Bobbitt, 1999). More recently, the National Longitudinal Transition Study-2 (NTLS-2) showed that persons with disabilities were 13% less likely to graduate than their non-disabled peers (Newman, et al., 2011). Specific to LD, these students graduate at rates that are 14% to 20% lower than their peers (Greenbaum, Graham, & Scales, 1995; Murray et al., 2000), indeed the NTLS-2 indicates that students with LD graduate at a rate of 38%. No comparable data were found related to graduation rates of students with ADHD. Other information related to special academic circumstances and academic performance of students with ADHD/LD (e.g. time to graduation, academic withdrawals, academic ineligibilities, course underloads) is not available in the literature.

In addition to graduation itself, average time to graduation varies among college undergraduates. In a large national sample, 76% of students graduated within 6 years of enrolling; 44% graduated within 4 years, 23% graduated within 5 years, and 9% graduated in their sixth year (NCES, 2011a). Scant data are available related to length of time to graduate for students with ADHD/LD, other than suggesting that they require at least one and often two semesters longer to graduate than others (Jorgensen et al., 2003; Vogel & Adelman, 1992). The relevance of this difference is that less time to graduation relates to higher wage earnings (Flores-Lagunes & Light, 2010) and having to pay tuition for more semesters. Those who earned bachelor's degrees within 4 years earned an average of $6,000 more annually than those who completed their degrees within 6 years (Carruthers et al., 2012).

Regardless of the length of time it takes to graduate, the importance of graduating from college is well documented. Consistent data report that a college education leads to better employment, financial earnings, and improved social status for both the general population and people with disabilities (Gilmore & Bose, 2005; U.S. Census Bureau, 2002). In addition, higher education promotes financial savings, fosters the ability to advance professionally, improves the quality of life for one's children, and enhances consumer decision making (Porter, 2002). For persons with disabilities in particular, completion of a postsecondary degree improves overall life satisfaction, employment outcomes, and the likelihood of achieving financial independence (Tagayuna, Stodden, Chang, Zeleznik, & Whelley, 2005).

Given the clear evidence of the importance of obtaining a college education, the success ADHD/LD students attain in postsecondary educational settings warrants greater attention. Reports that students with ADHD/LD do not seem as successful as their nondisabled peers on measures of GPA, graduation rates, and time to graduation are based on unadjusted data that do

not consider other differences among students, such as gender and race. Controlled studies related to the academic success of students with ADHD/LD are rare; the few that exist tend to focus on students with a diagnosis of either ADHD or LD rather than the common co-morbidity of these conditions, and are based on small sample sizes and self-report measures (Heiligenstein et al., 1999; Weyandt, & DuPaul, 2006). To begin filling this vast knowledge gap, this study examined the association between having ADHD/LD disabilities and academic success by using propensity score matching (PSM), a statistical procedure that creates an approximate control group (Rosenbaum & Rubin, 1983), and survival analysis to assess academic achievement of ADHD/LD students in postsecondary education. Outcomes under study are time to graduation, graduation, GPA, academic withdrawals, ineligibilities, and course underloads. While randomized controlled trials (RCTs) are considered the gold standard for estimating the effects of interventions on outcomes, propensity score methods mimic many of the characteristics of an RCT and are therefore able to maintain a great deal of both validity and generalizability (Austin, 2011).

Method

Sample

This retrospective cohort study evaluated 437 ADHD/LD students who entered a large public university as first-time freshmen between fall semesters of 2002 and 2007. These students presented themselves to the university's office for ADHD and LD services as eligible to receive supports. The academic performance of this sample was compared with the performance of a control group drawn from a random sample of 4,235 undergraduate students who belonged to the same cohorts but did not request ADHD/LD services from the university. Information related to diagnoses were obtained from the university's office for ADHD/LD students while all other data,

including those for control subjects were provided by the university's office of institutional research. Prior to the PSA, the ADHD/LD group (n = 437) had more males (54% vs. 40%), athletes (24% vs. 5%), and black students (16% vs. 11%), but fewer Asian/Pacific Islander students (2% vs. 6%) than the controls (n = 4,235).

Outcomes

The primary outcomes of interest were graduation and time to graduation, measured in months and beginning with each student's entry into the university. Students not graduated from the university as of December 2011 were considered to be censored. The propensity score matched data were examined to find between-group differences of the following six academic success variables, graduation; months to graduation; GPA; and three special academic circumstances of withdrawals, ineligibilities, and course underloads.

GPA was defined as the individual's cumulative college GPA. An academic withdrawal occurred when a student formally left the university and dropped all classes. An ineligibility occurred if a student did not maintain a satisfactory GPA of a 2.0 or higher, and did not participate in probationary interventions; these students were barred from registering for classes. A course underload allowed an undergraduate student to enroll in 9 to 11 credit hours rather than a minimum of 12 credit hours due to necessary cause.

Data Analysis

In this study, the PSM included year of entry into the university and birth year of the student to control for cohort/historic trends, and high school GPA, math and verbal SAT scores, gender, athlete status, and race/ethnicity to further balance the pairs. High school GPA and SAT scores (Zwick, & Sklar, 2005), gender (O'Neill, Markward, & French, 2012), athlete status (National Collegiate Athletic Association, 2012) and race/ethnicity (Zwick, & Sklar, 2005) have

all been shown to be associated with college graduation. Unadjusted differences in the potentially confounding characteristics between ADHD/LD and other students were compared with χ^2 tests for categorical variables and two-tailed unpaired t-tests for continuous variables in the unmatched cohort.

PSM approximates a randomized experimental research design by matching students with ADHD/LD to students without these diagnoses on a range of potentially confounding factors associated with the primary outcomes of interest: graduation and time to graduation. These factors are aggregated into a single propensity score, which represents the predicted probability that a student would be approved for services based on those confounding factors. In this way, PSM balances the groups so that no significant differences in confounding factors exist between the groups; by achieving this balance, the groups can be considered equivalent based on the covariates included in the PSM model and the matched groups can be compared on measures of academic success to determine between-group differences. Students were matched using the nearest-neighbor matching algorithm with a caliper score (imposed maximum distance) of one quarter of one standard deviation of the sample estimated propensity score, as suggested by Rosenbaum and Rubin (1985). Unadjusted differences in the matched cohorts were compared using McNemar tests and two -tailed paired t-tests.

Three models were run to examine ADHD/LD and time to graduation. The first model looking at the association between students approved for services and time to graduation was examined in the unmatched cohorts with unadjusted Cox proportional hazards model. The second, a multivariable model, included an indicator for ADHD/LD while controlling for the potentially confounding factors described above. To further account for nonequivalence in confounding characteristics between groups, the third and final model examined this association

with an unadjusted Cox proportional hazards model in the matched cohort, stratified by matched pair to account for the lack of independence induced by the matching procedure. For each model, the proportional hazards assumption was confirmed by inspection of log(-log[time to graduation]) curves and inspection of the Schoenfeld residuals produced by each model.

To examine other variables of academic success, χ^2 and 2-tailed paired t-tests were run for categorical and continuous variables respectively in the matched group. The a priori level of statistical significance was set at $p < 0.05$ for all analyses, which were two-tailed and performed using SAS version 9.3 and StataIC 12 (StataCorp, 2011).

Results

Student Characteristics in the Unmatched and Matched Samples

Matching retained 403 (92%) of the 437 students in the ADHD/LD sample. Table 1 presents baseline characteristics of students approved for ADHD/LD services and controls in the unmatched and matched cohorts. Compared to the unmatched controls, the unmatched cohort of 437 ADHD/LD students had significantly more males (54% vs. 40%, $p < .001$), athletes (24% vs. 5%, $p < .001$), and black students (16% vs. 11%, $p <. 001$) and fewer Asian/Pacific Islander students (2% vs. 6%, $p < .001$). These students had lower high school academic success outcomes including verbal SAT (598 vs. 635, $p <. 001$), and math SAT scores (622 vs. 650, $p <. 001$), and high school GPA (3.8 vs. 4.3, $p <. 001$) than the students in the unmatched control group. The PSA yielded a final matched sample of well-balanced cohorts of approved students with ADHD/LD ($n = 403$) and non-approved controls ($n = 403$); both samples were similar in all observed characteristics (Table 1).

Association of ADHD/LD and Graduation

Of the 437 ADHD/LD students approved for services, 305 (69.8%) graduated by the end of the study window, December 2011, as did 3,624 (85.2%) of the 4,253 controls (data not shown). The mean time to graduation was 53 months (standard deviation [*SD*] = 8.1) among the ADHD/LD students and 49 months (*SD* = 5.1) among the control sample. In an unadjusted Cox proportional hazards regression, ADHD/LD status was associated with a reduced graduation rate (HR 0.56; 95% confidence interval [CI] = 0.49-0.62; $p < 0.0001$) (see Table 2). However, given the significant differences in other potentially confounding baseline factors, adjustment for confounding was needed to obtain a more accurate and potentially less biased estimate of the association. After adjustment for the confounding baseline covariates, ADHD/LD status remained associated with a reduced graduation rate (HR 0.65; 95% CI = 0.57-0.73; $p < 0.0001$).

Table 1

Baseline Characteristics of Students with ADHD/LD and Controls

	Unmatched			Matched		
	ADHD/LD (n=437)	Controls (n= 4,253)		ADHD/LD (n=403)	Controls (n=403)	
Characteristic	*N (%) or Mean (SD)*		*P-value*	*N (%) or Mean (SD)*		*P-value*
Gender						
Male	237 (54)	1,696 (40)	<0.001	211 (52)	205 (51)	0.66
Female	200 (46)	2,557 (60)		192 (48)	198 (49)	
Race/Ethnicity						
White	325 (74)	3,114 (73)	0.60	314 (78)	319 (79)	0.65
Black	72 (16)	463 (11)	<0.001	50 (12)	52 (13)	0.81
Asian/Pac Islander	10 (2)	262 (6)	<0.001	10 (2)	11 (3)	0.81
Hispanic	18 (4)	184 (4)	0.84	17 (4)	10 (2)	0.14
Birth year	1986 (2)	1986 (2)	0.20	1986 (2)	1986 (2)	0.91
Athlete	106 (24)	217 (5)	<0.001	74 (18)	81 (20)	0.37
High School						
SATV	598 (102)	635 (75)	<0.001	609 (94)	613 (87)	0.91
SATM	622 (98)	650 (71)	<0.001	632 (90)	631 (80)	0.82
GPA	3.82 (0.63)	4.30 (0.39)	<0.001	3.91 (.55)	3.39 (.56)	0.41

Entry Year						
2002	56 (13)	698 (16)	0.46	52 (13)	72 (18)	0.16
2003	76 (17)	661 (16)		71 (18)	63 (16)	
2004	72 (16)	696 (16)		66 (16)	53 (13)	
2005	83 (19)	737 (17)		77 (19)	67 (17)	
2006	74 (17)	698 (16)		69 (17)	74 (18)	
2007	76 (17)	763 (18)		68 (17)	74 (18)	

Abbreviations: SATV-Average Verbal SAT score; SATM-Average Math SAT score, GPA-Cumulative grade point average

The two groups of 403 students in the matched samples were well balanced on all observed characteristics. Of the 403 ADHD/LD students in the matched sample, 287 (71.2%) graduated as compared with 328 (81.4%) of the control students. For students who graduated, the mean time to graduation was 53 months (*SD* = 8.2) for the ADHD/LD students as compared with 50 months (*SD* = 4.9) for the control sample. In an unadjusted Cox proportional hazards model using the matched cohorts (Table 2), ADHD/LD remained associated with a reduced graduation rate (HR 0.42; 95% CI = 0.32-0.55; $p < 0.0001$).

Table 2
Unadjusted and Adjusted Cox Proportional Hazard Rates of Graduation for Unmatched and Matched Cohorts of ADHD/LD Students and Controls

	Unmatched Analysis *HR (95% CI)*		Matched Analysis *HR (95% CI)*
Covariate	Unadjusted	Covariate Adjusted	Unadjusted
Sample Size	4,690	4,690	806
ADHD/LD	0.56 (0.49 - 0.62)	0.65 (0.57-0.73)	0.42 (0.32-0.55)
Male		0.80 (0.75-0.86)	
Race/Ethnicity (reference: white)			
Black		0.84 (0.75- 0.95)	
Hispanic		0.89 (0.75-1.05)	
Asian/Pacific Islander		0.91 (0.80-1.05)	
Other Race		0.80 (0.69-0.92)	
Birthyear		0.98 (0.92-1.05)	
Athlete		1.01 (0.87-1.17)	
High School			

SATV (100 points)	1.07 (1.01-1.12)
SATM (100 points)	1.06 (1.003 -1.12)
GPA	1.32 (1.21-1.45)
Entry Year	1.03 (0.97-1.10)

Abbreviations: SATV-Average Verbal SAT score; SATM-Average Math SAT score, GPA-Cumulative grade point average

Association of ADHD/LD and Other Academic Success Variables in the Matched Cohort

Table 3 further interprets the hazard ratio by examining actual numbers of academic success variables. Compared with the matched sample, students with ADHD/LD experienced significantly less academic success on almost all measures under study (see Table 3). Students with ADHD/LD had significantly lower college GPAs, (2.78 vs. 2.98, $p < .0001$), and more ineligibilities (19% vs. 9%, $p < .001$), and underloads (10% vs. 6%, $p = 0.018$). The proportion of withdrawals between groups was not significant (20% vs. 17%, $p = 0.24$). Finally, among students who graduated, ADHD/LD students took longer to complete their degree (53 vs. 50 months).

Table 3
Academic Success of Students with ADHD/LD and Controls (Matched)

	ADHD/LD (n=403)	Controls (n=403)	
	N (%) or Mean (SD)		*P-value*
Graduation			
Graduated	287 (71)	328 (81)	<0.001
Did not graduate	115 (29)	84 (21)	
Months Graduation[a]	53 (8.2)	50 (4.9)	n/a
Grade Point Average			
Cumulative GPA <0.0001	2.78 (0.60)	2.98 (0.57)	
Special Academic Circumstances			
Withdrawals	81 (20)	68 (17)	0.245
Ineligibilities	76 (19)	38 (9)	0.0001

Underloads	41 (10)	23 (6)	0.018

[a]Among students who graduated (a p-value could be calculated: Data were in matched pairs but a paired t-test could not be run because pairs were split when the students who did not graduate were removed)

Discussion

This research evaluated the academic success of ADHD/LD students compared to a sample of matched controls at one large public university, a more rigorous comparison than conducted in any prior published work. The outcomes confirm that ADHD/LD students experience less academic success than students without similar diagnoses. They are less likely to graduate, and those who do graduate take longer to finish their degrees. Further, as compared with nondisabled peers, students with ADHD/LD have lower GPAs and higher rates of withdrawals, ineligibilities, and course underloads, all of which indicate academic challenges and are significantly and negatively correlated with graduation ($p < .001$ for all, data not shown). This academic success gap is a problem because taking longer to complete a college degree and failure to graduate from college are likely to have adverse effects on future outcomes such as life satisfaction and financial success.

Given the outcomes of this study, it seems that institutions need to actively seek to implement evidence-based interventions to assist ADHD/LD students. By offering supports in addition to legally mandated accommodations, colleges can better ensure that students with ADHD/LD are being provided with equal opportunities in postsecondary education. Moreover, by creating this type of living laboratory for students with ADHD/LD, institutions can provide students with the opportunity to learn life skills to cope with issues raised by their disorders while in a protected space that will better prepare them for successful independent life, after college.

Although the graduation rate for ADHD/ LD students was 10 percentage points lower than the rate of controls, a rate of 71% remains impressive. For the 2004 cohorts, the national 6-year average graduation rate for all college students enrolled in four year institutions is only 58% (NCES, 2011b). The higher graduation rates found in this study perhaps speaks to a greater resilience among the students in this study, the caliber of those accepted to the university, and/or the support services provided by this university. The combination of these factors might give students with ADHD/LD the boost they need to succeed in postsecondary education and persist despite their learning challenges. The university that provided student data used in this work has a support services office that offers legally mandated accommodations as well as extra supports from learning specialists such as coaching and instruction and support in developing learning strategies to overcome the challenges of ADHD/LD disabilities. Given the dramatic increase in the college enrollment of students with ADHD/LD, there is clear need for effective interventions to support these students as they pursue an education to meet their life goals.

The development and implementation of effective and efficient interventions that meet the needs of these bright but vulnerable students falls to the responsibility of the colleges and universities serving these students. Beyond legally mandated services, a handful of intervention strategies have been empirically shown to be effective techniques for assisting ADHD/LD college students in their academic endeavors including learning strategy instruction and both peer- and instructor-led tutoring (Richman, in preparation, 2013). Additionally, although not yet validated with college-aged students with ADHD/LD, both coaching and support groups show promise of becoming substantiated practices (Richman, in preparation, 2013). These interventions should be implemented across college campuses to help students with ADHD/LD attain academic success equal to that of other students. Future research should focus on further

evaluation of current and potential (e.g. assistive technology and summer transition programs) best practices to improve academic outcomes for college students with ADHD/LD (Richman, in preparation, 2013).

This research was subject to several limitations. First, as is the case with propensity score analyses in general, there are both unavailable and unobservable covariates that could not be included in the models and thus could not be controlled for in this analysis. Some of those variables especially relevant for the outcomes under study include variables like parental income (Rouse & Borrow, 2006), and personal resiliency (Lessard, Fortin, Marcotte, Potvin, & Royer, 2009). In addition, students included in the ADHD/LD group were self-selected in that they voluntarily identified themselves to college personnel as having a disability. Given that many students choose not to disclose their disability (Newman et al., 2011), it is likely that many students diagnosed with ADHD/LD remained in the random sample/controls. If true, the success of the control sample is likely to have been tempered, suggesting the differences between ADHD/LD and other students are even greater than those detected here. Finally, generalizability was compromised because these data are from only one university. Future research should seek to replicate these findings in other postsecondary settings and to specifically examine subsets such as minority or low-income students.

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CONCLUSION

Summary

The severe and damaging effects of ADHD/LD on the academic success of postsecondary students with these disorders have been well documented. Finding effective interventions to help students with ADHD/LD attain academic success is urgently needed given the growing numbers of college students with these disabilities. University-based support programs are currently at a severe disadvantage because of the scarcity of empirical evidence available to guide the implementation of existing, and the development of new, effective supports. In response to this lack of evidence, paper one presented a review of the peer-reviewed literature evaluating the efficacy of six support services that are optionally offered by university-based ADHD/LD services.

Overall, the study results indicate the field of disability services is moving toward greater reliance on evidence based practice, but the current level of evidence remains inadequate. Only two of the six voluntary supports—learning strategy instruction and tutoring—have been tested and validated among students with ADHD/LD. Coaching and support group interventions have not been validated with college-aged students with ADHD/LD, but both interventions show promise of becoming substantiated practices, and finally, assistive technology and summer transition programs require substantially more research to determine whether these are effective interventions for students with ADHD/LD.

Recommendations are that learning strategy instruction, tutoring, coaching and support groups continue to be used as support services for college students with ADHD/LD, but that the latter two be further tested for effectiveness. Without rigorous evaluation, it is impossible to

know whether assistive technology and summer transitions improve the experiences of students with ADHD/LD and further research is necessary

Paper two described the characteristics, diagnoses, service use patterns, and academic success of students approved for ADHD/LD services, examined the relationships among those variables, and compared students who received a dual diagnosis of comorbid ADHD/LD with students diagnosed with only one. While this research yielded many important outcomes, among the most salient were that ADHD/LD students take one to two semester more to graduate than the average student, and the difference is significantly greater for students who only use accommodations. Also, most students who register for services do actually take advantage of them at least twice, but those who never return are no worse off academically. Finally, students who had more service contacts were more likely to have higher GPAs.

By using an approximate control group, paper three compared the academic success of ADHD/LD students with a matched sample, a more rigorous comparison than conducted in any prior published work. The outcomes confirm that ADHD/LD students experience less academic success than students without similar diagnoses. They are less likely to graduate, and those who do graduate take longer to finish their degrees. Further, as compared with nondisabled peers, students with ADHD/LD have lower GPAs and higher rates of withdrawals, ineligibilities, and course underloads.

Taken together, this research indicates that ADHD/LD students are experiencing more difficulties in college than did their non-disabled peers, but despite their hurdles, they continue to thrive and graduate, albeit slower and at lower rates. This work clarifies that providing additional services alongside legally mandated accommodations can assist this group of students during their college careers. For the first time in peer-reviewed literature, this study has reported the

demographics, diagnoses, type and amount of service use, graduation rates, and other variables for a large sample of college students with ADHD/LD. Obtaining a baseline of information related to a group of students with disabilities is the vital first step to better understanding their needs in order to begin conduct intervention research which will ultimately promote the college success of this group.

Translating the Research into Practice

While the ultimate goal of social work is to empower vulnerable populations, people with ADHD/LD (and with disabilities in general) are not one of the typical disadvantaged groups focused on by social workers. The results of this work has shown that this group is indeed a vulnerable population, should not be overlooked, and this research therefore, has important implications for social work education, school social workers, researchers, and practitioners who help families cope with these difficult life circumstances. This work confirms that these students are at risk for not succeeding in college which often has adverse effects on life satisfaction and financial security (Gilmore & Bose, 2005; Tagayuna, Stodden, Chang, Zeleznik, & Whelley, 2005), and when so often paired with other research showing increased rates of depression, anxiety, substance use, and other comorbid diagnoses, the result is the high potential for compounded and substantial difficulties in college and in life (Barkley & Brown, 2008; Blase et al., 2009; McGillivray & Baker, 2009).

Given the disadvantages faced by this group, it is the responsibility of social workers to better understand their needs and the barriers many must overcome and to act as their advocate. Social work education can begin to emphasize the vulnerability of these students which in turn will better educate school social workers and other practitioners to enable them to serve individuals and families in the community who regularly cope with ADHD/LD disabilities,

stigma, and related susceptibilities. Further, social workers have a strong belief in the critical nature of intervention research, i.e. conducting research that gets directly translated into improving and creating effective interventions for vulnerable populations.

Reasons ADHD/LD students are at risk for less academic success seem to stem not from intelligence levels (Cordeiro, et al., 2011), but instead from a range of difficulties that span simple classroom distractions during exams, to managing one's time effectively and staying organized, to fear of or reactions to stigma associated with their disability. How to combat these barriers however, is not yet clear, some interventions boast a great deal of evidence of effectiveness while others have little or none (Richman, in preparation, 2013). The most obvious response is to conduct additional intervention research of current and new interventions aimed at assisting this population in order to find methods that are effective.

Beyond intervention research, it is imperative that students and their families become more aware of potential barriers they are likely to encounter during high school and college. Awareness can promote measures that can be taken before and during college by individuals and their families, school administrators, and policy makers which have the potential to improve overall outcomes. Increased awareness can prompt individuals and their families to prepare themselves for the difficulties as the student transitions to college. Understanding that students in this group may be at higher risk for making lower grades, may need to apply for special academic circumstances or other help, or may take longer to graduate, may potentially alter their expectations and improve their preparedness. For example, parents who know that their child is likely to take more semesters to graduate may be less likely to experience disappointment and may then be more accepting and supportive. Similarly, this knowledge may give students the freedom not to feel personal failure simply because they require assistance in college. Further,

armed with the knowledge that students with higher grades are likely to have more service contacts with ADHD/LD learning specialists, they may be more likely to seek services upon entering school rather than waiting until they experience a serious problem or set-back to ask for help.

High schools are a key setting in which increased awareness and education can help prepare students for college success. High school teachers, social workers, and administrators are in the unique position to promote independence and strong executive functioning skills for all students, but particularly for those with ADHD/LD. In high school, many diagnosed youth are automatically offered academic assistance as per the American's with Disability Act (Allsopp, Minskoff, & Bolt, 2005), but in college, beyond basic voluntary accommodations for formally diagnosed students, assistance is not guaranteed. High school educators and social workers have the opportunity to reach out to their students to explain that in college, assistance can be obtained only if students act as their own advocates and seek help. Further, they can explain how new challenges will arise because neither parents nor teachers will be monitoring student schedules or responsibilities and no one will be there to hold them accountable.

Policy makers and other college personnel have some responsibility to these students and should be creating environments that are responsive to their needs. With the understanding that individuals with ADHD/LD are both capable and bright but often have trouble in learning environments, it follows that these students should be considered an at-risk group and be provided with settings and interventions that promote their success. For example, some colleges prefer that students take only eight semesters to graduate, and require that they apply to enroll for extra semesters if necessary. This research clearly shows that ADHD/LD students will graduate at similar rates to their non-disabled peers if given extended time. Therefore, it behooves school

policy makers to understand that this particular policy may be putting restrictions on these students that could be prohibiting their graduation. More research is necessary to understand if such policies are having the unintended impact of precluding ADHD and LD students from graduating. Also, it appears that schools should offer students empirically supported intervention services beyond that of basic accommodations, and ensure that students are aware of the services to which they are entitled. Finally, to further the agenda, schools must require program evaluation for their ADHD/LD service offices and they must monitor who uses services and to what extent. Such knowledge would assist in better understanding and serving these students.

This work was subject to several limitations. First, except the literature-based research, all comparative analyses were conducted using data from a single university and all ADHD/LD students self-selected to receive services. These two limitations threaten generalizability and internal validity. Despite these drawbacks, given the little available knowledge about college students with ADHD/LD, this study has established an important foundation for future research on the success of college students with these disabilities as well as best practices in service delivery. As disadvantaged individuals, students with ADHD/LD and disabilities in general are under-studied by social work researches. This vulnerable population requires support from their schools and communities to help decrease their risk for health, academic, and socio-economic disparities. Future research should address issues surrounding further evaluation of current and potential best practices to improve academic outcomes for college students with ADHD/LD. Efforts should focus on why these students require increased number of semesters to graduate, how to help students cope with and potentially raise their college GPAs to levels comparable to the rest of the student body, and possible barriers to service use.

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