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## Promoting academic success in college students with ADHD and LD: A systematic literature review to identify intervention targets

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### ABSTRACT

**Objective:** College students with attention-deficit/hyperactivity disorder (ADHD) and/or a learning disorder (LD) are at higher risk for not attaining a bachelor's degree. The purpose is to identify the predictors of academic success in college for students with ADHD and/or LD using a systematic review of the literature. **Method:** Academic Search Premier, Education Full Text, Education Source, Education Resources Information Center, Teacher Reference Center, PsycINFO, PsycArticles, and Primary Search and relevant journals were searched using PRISMA guidelines. Studies were screened based on the following inclusion criteria: college students with ADHD and/or LD, student characteristics as predictors, and GPA and/or retention as outcomes. **Results:** Twenty-one studies were included (20 quantitative studies and 1 randomized control trial). Academic regulation, academic self-efficacy, emotional regulation, ADHD symptoms, and academic and social integration predicted college success. **Conclusion:** Incorporating these components into interventions with students with ADHD and/or LD may enhance their success in college.

### ARTICLE HISTORY

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### KEYWORDS

ADHD; learning disorder;  
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regulation; academic  
self-efficacy

In the United States, those who acquire a bachelor's degree earn approximately 74% more annually than those whose highest level of education is a high school diploma (based on median annual salaries).<sup>1</sup> Individuals who graduate from a 4-year college acquire higher occupational status and lifetime earnings.<sup>2</sup> Just over half of students (58%) who begin college (at a 4-year public university) go on to graduate within six years.<sup>3</sup> However, those with ADHD and/or a learning disorder (LD) enroll in four-year institutions and complete degrees at lower rates (e.g., 41% completion for LD).<sup>4,5</sup> College prevalence rates for ADHD are estimated to be between 2% and 8%<sup>19</sup> and 5% to 20% for LD.<sup>6,7</sup> Students with ADHD and diagnosed LD make up approximately one-fourth and one-fifth of college students with disabilities, respectively.<sup>8</sup> However, these may be underestimates of the actual prevalence rates in college given that many students do not disclose these disabilities to obtain university-sanctioned academic accommodations, especially without transition support from a high school counselor.<sup>9</sup> High rates of attrition are costly for states, institutions, and students because there is no return on the initial investment in enrolling in courses. Graduating from college will improve career opportunities, social capital, and general quality of life in these individuals.<sup>10</sup>

First-year academic performance (i.e., grade point average [GPA]) is a strong predictor of persistence in attaining a bachelor's degree,<sup>11</sup> gaining entrance to graduate school, and obtaining employment.<sup>12</sup> To improve graduation rates,

institutions have focused on selecting students who will succeed in college (e.g., using standardized test scores and previous academic performance)<sup>13</sup> and aiding students in increasing academic achievement once enrolled (e.g., supplemental instruction, tutoring).<sup>14</sup> Because academic performance impacts persistence in college, determining which factors affect college GPA will aid in developing interventions for students with ADHD and/or LD during high school and when they begin college.

Previous research indicates that performance on the SAT or ACT combined with high school GPA (i.e., *traditional* predictors) accounts for approximately 25% of the variability in college GPA during the first year.<sup>15</sup> In the past two decades, researchers have begun to identify other factors that affect college students' GPA and degree attainment after accounting for standardized test performance and high school GPA. Although most research has been conducted on institutional factors (e.g., size of the institution, faculty-student ratios), there has been a call for a better understanding of the psychological factors that predict both college GPA and retention.<sup>16</sup>

Characteristics internal to college students, such as executive functioning (e.g., effort regulation),<sup>17</sup> psychopathology, learning difficulties, lifestyle factors (e.g., sleep hygiene),<sup>18</sup> and personality traits<sup>19</sup> have all shown to be associated with GPA in college student populations. For example, higher self-reported levels of conscientiousness, or being highly self-disciplined and maintaining an achievement orientation,

are related to higher academic performance.<sup>20</sup> Additionally, higher academic self-efficacy, achievement motivation, type of goal orientation (i.e., mastery of material versus grade earned), and study skills are linked with higher GPA.<sup>19</sup> Further, after accounting for socioeconomic status (SES) (SES), high school GPA, and ACT/SAT scores, an additional 27.3% of the variability in first-year GPA has been accounted for by psychosocial factors and study skills, with academic self-efficacy and achievement motivation accounting for the most variability.<sup>15</sup>

Compared to GPA studies, fewer studies have been conducted to examine predictors of retention in college. Of those, researchers have focused on predictors of retention rates related to persisting from first to the second semester of the first-year or returning for the second year (i.e., proximal outcome measures). *Traditional* predictors of college success, such as standardized tests, have not shown to be directly related to college retention.<sup>21</sup> Feeling competent to perform adequately in the classroom (i.e., academic self-efficacy)<sup>22</sup> as well as academic engagement (e.g., commitment to institution and social integration) and proficient study skills are predictive of persistence in college for typical college students.<sup>15</sup> In sum, several psychological correlates of academic performance and retention have been identified; however, fewer studies have been conducted to examine those unique variables that impact outcomes for academically at-risk students due to impairments related to ADHD and/or LD. This is problematic given these students' experience of higher rates of failure in college.

ADHD is characterized by impairment caused by symptoms related to inattention and/or hyperactivity/impulsivity. Individuals who continue to meet diagnostic criteria for ADHD as well as those who experience subthreshold symptomatology continue to experience significant impairment.<sup>23</sup> Some have hypothesized that academic impairment in college is due to increased requirements to regulate behavior in the context of far less structure during college compared to high school, but few have tested this directly.<sup>24</sup> Research has documented lower levels of academic achievement in college students with ADHD compared to their non-ADHD counterparts, with a medium estimated effect (i.e.,  $d = .71$ ).<sup>25</sup> This lower academic achievement may lead to increased dropout and attaining lower occupational status compared to those without ADHD.<sup>5</sup> Further, college students with ADHD are more likely to experience comorbid depression and anxiety,<sup>26</sup> as well as engage in risky behaviors (e.g., alcohol abuse),<sup>27</sup> both of which may hinder their academic achievement and degree attainment.

Students with LD are enrolling in four-year postsecondary institutions at increasing rates, possibly due to extensions of the American with Disabilities Act in recent years, yet they continue to face unique challenges specific to written language, reading skills, and/or mathematics difficulties.<sup>28</sup> They may exhibit deficits in concepts related to these broad academic areas and or difficulty applying these skills accurately and fluently.<sup>29</sup> These impairments have direct negative impacts on the ability to complete academic tasks, especially at the college level.<sup>30</sup> Much research has focused

on describing differences in psychological factors in students with LD compared to students without, but few studies have focused on determining the factors that are associated with the essential outcomes of GPA and persistence in college. The identification of malleable factors that predict continued persistence in college would allow for targeted interventions before beginning college and during the first semesters for this academically at-risk college population.

In sum, college students with ADHD and/or LD experience significant academic impairment, often leading to low GPAs and dropout,<sup>31,32</sup> leaving these individuals without a college degree and potentially economically disadvantaged.<sup>33</sup> However, beyond ADHD and LD symptom severity, few studies have been conducted to determine specific mechanisms that impact objective measures of academic functioning (i.e., GPA, retention). Importantly, no reviews have examined psychosocial predictors of GPA and retention for students with ADHD and/or LD, leaving many questions unanswered. In terms of college students with ADHD, previous reviews have focused on summarizing the prevalence, academic functioning, and comorbid difficulties,<sup>9</sup> summarizing the academic, psychosocial, and neuropsychological characteristics,<sup>32</sup> and the developmental context of emerging adulthood and college to inform psychosocial treatments.<sup>24</sup> For the LD population, reviews have not been systematic and have focused on describing areas of impairment in adulthood<sup>34</sup> and describing interventions that are currently being employed in college settings.<sup>35</sup> Recommendations for interventions with college students have been made based on these reviews, yet these have not been based on identifying predictors of college success. Further, to date, no systematic review examining psychosocial predictors of college GPA and retention have been conducted for those with ADHD and/or LD. The current systematic review is warranted to evaluate the methodological rigor of studies on the topic to date and to aggregate extant empirical literature to identify factors that may improve GPA and retention. Identifying gaps in the literature is necessary to identify targets to be included in interventions and to inform future research with this population. Although it is widely understood that ADHD and LD cause academic impairment in college, the mechanisms have not been clearly delineated and synthesized. Findings from the current systematic review may inform interventions for high school students, summer "bridge" or college readiness participants, and first year college students, with the aim of improving college success.

### Current study

The purpose of this review is to systematically examine the psychological factors that predict college GPA and retention in students with ADHD and/or LD. This will allow us to identify potential intervention targets to improve academic success in college. As previous reviews have not addressed factors that impact objective academic outcomes in this population, the current study fills a critical gap in the literature. Furthermore, interventions have been developed in

good faith based on a few studies with less than optimal methodological rigor, which may lead to decreased intervention effectiveness. A literature search was conducted to identify studies with college students worldwide that examine predictors of GPA and retention for those with ADHD and/or LD. The aims were threefold: 1) identify studies based on specific inclusion and exclusion criteria, 2) evaluate identified studies based on the relevance of research questions, sampling strategies, measurement, and data analyses, and 3) summarize the current state of the literature, including areas for future directions. Data extraction was conducted using PRISMA review guidelines and study quality was determined using the Mixed Methods Appraisal Tool (MMAT).

## Method

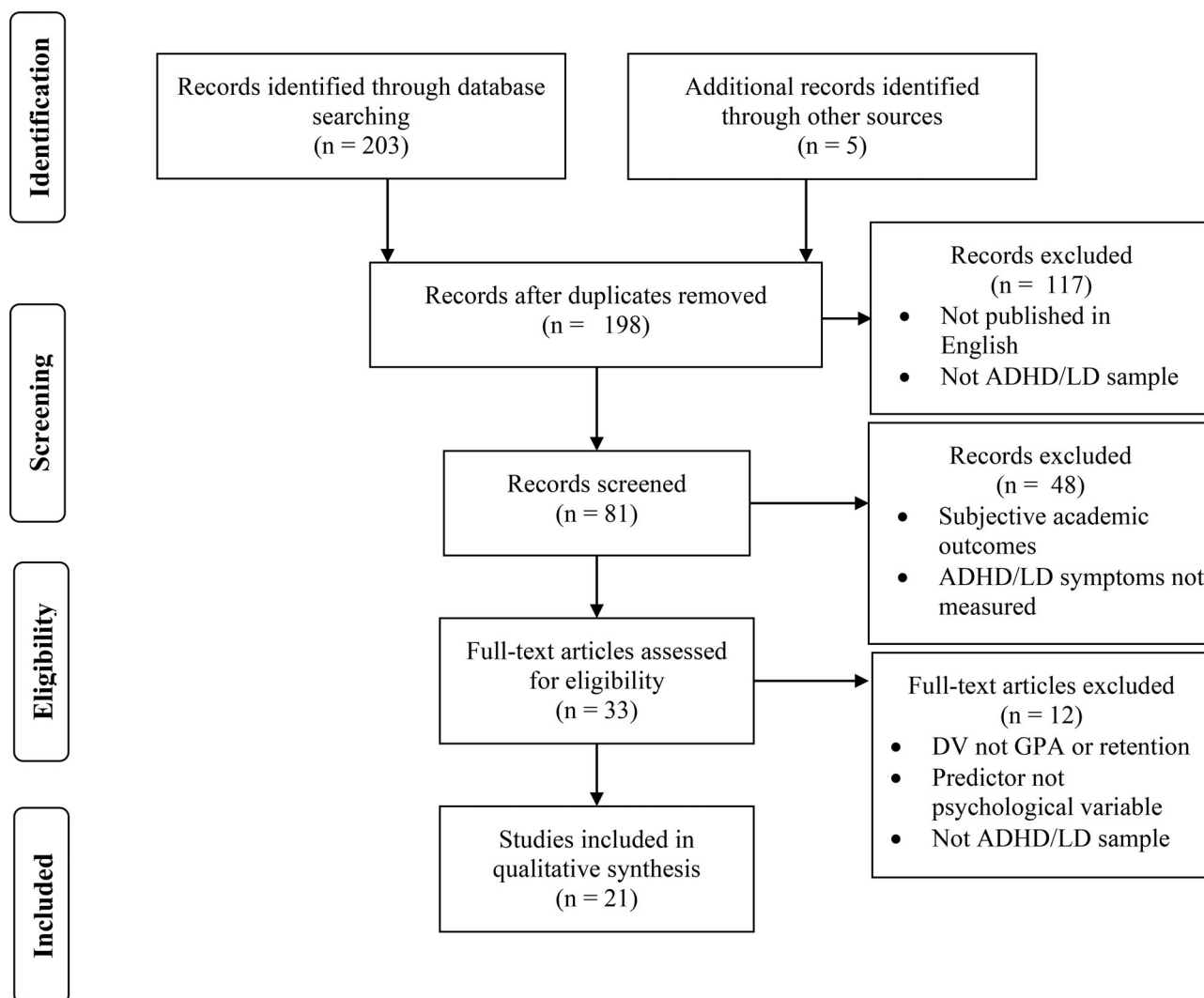
A literature search was conducted to examine the psychological factors that are associated with at-risk college student GPA and retention. Databases searched were chosen to include studies from psychological and educational peer-reviewed journals and included Academic Search Premier, Education Full Text, Education Source, Education Resources Information Center (ERIC), Teacher Reference Center, PsycINFO, PsycArticles, and Primary Search. Articles were identified using a systematic process that included four steps (see the Appendix for an example of one fully articulated search algorithm). The search was refined to include any English-language article published in a peer-reviewed journal prior to July 2020 worldwide (English-language articles with studies conducted in Canada and Israel were included because the studies met inclusion criteria). Search terms related to college students with ADHD and LD were used to identify articles targeting the appropriate sub-population of at-risk students. Potential independent variables were identified based on comprehensive reviews and meta-analyses examining predictors of GPA and retention in the general college student population (e.g., learning strategies, academic self-regulation, personality characteristics, motivation, academic goals, and academic self-efficacy).<sup>15,19</sup> In the last step of the search, terms included words and phrases related to the two primary outcome variables of college GPA and retention. The wildcard (\*) was used to include multiple versions on keywords to increase the likelihood of locating relevant studies (e.g., *strateg\**). In addition to the systematic search across several educational and psychological databases, targeted searches were conducted within specific education journals. Specifically, archives for the *Journal of College Student Retention*, the *Journal of Postsecondary Education & Disability*, *Learning Disabilities: Research and Practice*, *Journal of Learning Disabilities*, *Journal of American College Health*, and the *Journal of College Student Development* were searched for the specified population of at-risk students (e.g., "ADHD," "learning disorder") and or for the outcome variables (e.g., "GPA," "retention."). Reference lists in studies identified using the database and journal archives were reviewed for additional relevant studies.

Specific inclusion and exclusion criteria were decided upon prior to the literature search based on the aims of the review (e.g., used GPA and retention because these objective measures of academic performance are predictive of attaining a college degree, but have not been reviewed in this population). During the review of potential articles, the authors discussed whether to include both clinical (with a well-defined diagnosis of ADHD and/or LD) and community samples (surveying the general college student population on measures of ADHD and LD). After discussing the pros and cons, all authors agreed to include both types of studies because those who do not meet diagnostic criteria for ADHD and/LD as an adult most likely experience significant daily impairment and would benefit from interventions designed to improve academic performance.<sup>36</sup>

PRISMA guidelines for reporting items for systematic reviews were followed (see Figure 1).<sup>37</sup> Assessment for inclusion was conducted by the first author (AS). Articles were retained for the review if the sample included students with identified ADHD or LD diagnosis, elevated symptom endorsement, or symptoms measured in a general student sample, currently enrolled in a four-year postsecondary institution (or group-based analyses that included an at-risk group and non-at-risk group); independent variables that were deemed psychological factors (i.e., attributes, characteristics, beliefs, behaviors internal to students); and outcome variables included GPA and or retention at any point. Studies were excluded if they did not include the above criteria. Studies were most often excluded because they did not include GPA or retention as the outcome variable and used subjective measures of adjustment to college (see below for details on excluded articles).

## Quality appraisal

The MMAT<sup>38</sup> was used to appraise the eligibility and methodological quality of each article (see Table 2). Both the first and second authors (first and second author initials omitted to maintain blind) completed the screening questions (clear research questions and data allow for the research question to be addressed) for all included articles. Findings were compared, and the second author (second author initials omitted to maintain blind) extracted the methodological quality data from all studies included in the systematic review. The first author (first author initials omitted to maintain blind) reviewed a random sampling of four included studies (~20%) to determine reliability of data abstraction. The first author (first author initials omitted to maintain blind) also reviewed instances in which it was unclear whether a study met the methodological quality criteria (i.e., "unclear" response). Disagreements about "unclear" responses were resolved by re-reviewing the article to determine whether ample evidence was present. After re-reviewing studies and discussing the evidence, the first and second authors were in 100% agreement.



**Figure 1.** Article flow diagram.

Adapted from: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Med* 6 e1000097. doi:10.1371/journal.pmed1000097

## Results

### Search outcome

The initial literature search resulted in 203 records through database searching and 5 records through searching in specific journals (see [Figure 1](#) for PRISMA diagram). After duplicates were removed 198 records remained. These 198 abstracts were screened for eligibility (college student sample, indication and measurement of ADHD and/or LD clinical or community sample, some or all predictor variables were malleable psychological variables, outcome variables included GPA and/or a measure of retention toward a college degree). Studies were excluded after the abstract review if they were not in English and did not include the eligibility criteria noted above. The method sections of the remaining 81 studies were reviewed to further determine eligibility if it was unclear after reading the abstract. Records were excluded because the academic outcomes were subjective, and they did not include college students with ADHD and/LD. Out of these 81 records, 33 full-text articles were assessed for eligibility. Twelve studies were excluded because

the dependent variable was not college GPA or persistence ( $n=6$ ), the predictor was not a psychological variable ( $n=2$ ), or students with LD were not included/identified and/or ADHD symptoms were not measured ( $n=4$ ). This resulted in 21 included studies ranging in publication year from 1998 to 2019, with 11 studies from the last 10 years (studies were descriptive/cross-sectional,  $n=7$ ; cross-sectional with a comparison group,  $n=6$ ; longitudinal,  $n=7$ ; and intervention study,  $n=1$ ; see [Table 1](#) for article list). All articles included GPA as an outcome variable, and two studies included a measure of retention (i.e., enrollment in the second year and total credit hours accrued). Identified predictors of academic success included academic self-regulation (study skills and learning strategies, procrastination, time management, and motivation;  $n=13$ ), academic self-efficacy ( $n=3$ ), emotional regulation ( $n=3$ ), symptom management ( $n=4$ ), and academic and social integration ( $n=3$ ). Several articles included predictors from multiple categories and were, therefore, included in more than one section below. Across articles, there were multiple independent or predictor variables in each study that were deemed as



**Table 2.** Quality assessment of included studies.

Type of Study	Study	Screening Questions		Methodological Quality Criteria				
		Are there clear research questions?	Do the collected data allow the research question to be addressed?	Is the sampling strategy relevant to address the research question?	Is the sample representative of the target population?	Are the measurements appropriate?	Is the risk of nonresponse bias low?	Is the statistical analysis appropriate to answer the research question?
1. Quantitative Descriptive	Advokat et al. (2011)	Yes	Yes	Yes	No	Yes	Yes	Yes
	Bergey et al. (2018)	Yes	Yes	Yes	Unclear	Yes	No	Yes
	Chevalier et al. (2017)	Yes	Yes	Yes	Unclear	Yes	Yes	Yes
	DaDeppo et al. (2009)	Yes	Yes	Yes	No	Yes	Yes	Yes
	Dvorsky et al. (2019)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Fleming et al. (2016)	Yes	Yes	Yes	Yes	Yes	Yes	No
	Frazier et al. (2007)	Yes	Yes	Yes	No	Yes	Yes	Yes
	Glutting et al. (2002)	Yes	Yes	Yes	No	Yes	No	Yes
	Gormley et al. (2018)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Hen et al. (2014)	Yes	Yes	Yes	No	Yes	Yes	Yes
	Khalis et al. (2018)	Yes	Yes	Yes	Unclear	Yes	Yes	Yes
	Lanberg et al. (2013)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Murray et al. (2003)	Yes	Yes	Yes	No	Yes	Yes	Yes
	Norwalk et al. (2009)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Reaser et al. (2007)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Ruban et al. (2003)	Yes	Yes	Yes	No	Unclear	No	Yes
	Schwanz et al. (2007)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Shmulsky et al. (2007)	Yes	Yes	Yes	Unclear	Unclear	Yes	No
	Turnock et al. (1998)	Yes	Yes	Yes	No	Yes	Yes	Yes
	Zysber et al. (2017)	Yes	Yes	Yes	No	Yes	Yes	Yes
2. Randomized Controlled Trial	Scheithauer et al. (2014)	Yes	Yes	Yes	No	No	Unclear	Yes

malleable psychological variables (e.g., study habits, learning self-efficacy, ADHD symptoms; see Table 1). Across studies, there were several variables that were not considered in the current review because we did not consider them to be malleable psychological variables (e.g., high school GPA, parent education level, SAT scores).

### Quality appraisal

The quality assessment of included studies is summarized in Table 2, using the MMAT.<sup>38</sup> In terms of the representativeness of the target population, the majority of the studies ( $n = 14$ ) were deemed not representative (or “Unclear” based on lack of information) based on lack of racial/ethnic diversity. Four studies did not report on the racial/ethnic background of the sample, and 10 studies included samples that were mostly white college students. Given this lack of representativeness, the findings from the reviewed studies may not generalize to students of color. Most of the studies included a higher proportion of women ( $n = 9$ ) or had a relatively even split across men and women ( $n = 8$ ). Two studies did not provide information on participant sex. No study included information on whether analyses were run separately for men and women to determine whether differences emerged across sex. Participant sampling and recruitment methods were largely strong ( $n = 17$ ), decreasing the risk for nonresponse bias. In terms of the quality of the tools chosen to measure predictor and outcome variables, the majority of studies included psychometrically-sound survey measures ( $n = 18$ ) and GPA and retention data from the university registrar ( $n = 13$ ). Statistical analyses used to

answer research questions were primarily multiple regressions and group comparisons. There were two instances in which analyses appeared inadequate to answer the research question (e.g., correlation instead of multiple regression). The studies that had the highest methodological rigor were those with a longitudinal design ( $n = 7$ ) in which predictor variables were collected at the beginning of the academic year and GPA and/or retention was collected from the registrar at the end of the year or following year. The predictor categories included in these stronger studies were academic self-regulation ( $n = 1$ ), academic integration ( $n = 1$ ), and symptom management ( $n = 4$ ). Notably, the strongest longitudinal study included both self- and parent-report of multiple malleable predictors of GPA (academic self-regulation, emotional regulation, motivation, ADHD symptom management), allowing for a comparison of the relative strength of these predictors across raters.<sup>39</sup>

### Academic self-regulation

Academic self-regulation includes using skills and strategies to complete academic tasks. Strategies that have been examined with GPA and persistence included study skills and habits, time management, procrastination, self-monitoring and the use of compensatory strategies both internal (e.g., audio record lectures) and external to the student (e.g., use of campus resources). In general, the use of study skills, planning, completing course assignments, paced studying for exams, higher motivation, and less procrastination were associated with success in college for students with ADHD. The use of metacognitive reading skills, study skills, less

**Table 1.** Summary of articles.

Descriptive/Cross-Sectional Design				
Study	Independent and Dependent Variables	Participants	Predictor Category	Results
DaDeppo (2009)	IV: Freshman Year Survey (Milem & Berger, 1997) DV: GPA from Registrar	<i>N</i> = 97 freshmen and sophomores All diagnosed with LD 89% European American 59% men No data on age	Academic and social integration	Academic and social integration did not predict GPA. Academic and social integration predicted intent to persist. Social integration accounted for greater variance in students' intent to persist compared with academic integration.
Fleming & Wated (2016)	IV: Self-Efficacy for Learning Form (Zimmerman & Kitsantas, 2007) DV: Self-reported GPA	<i>N</i> = 74 (Age <i>M</i> = 21.62, <i>SD</i> = 3.00) LD group <i>n</i> = 28; ADHD group <i>n</i> = 16 LD and ADHD group <i>n</i> = 12 Full sample: 31% Caucasian, 28% Hispanic, 10% African American, 1% Asian, 23% undisclosed 41% women (22% did not report on their sex)	Academic self-efficacy	Higher academic self-efficacy was associated with higher GPA.
Murray & Wren (2003)	IV: The Survey of Study Habits and Attitudes (Brown & Holtzman, 1969) DV: GPA from Registrar	<i>N</i> = 84 (students diagnosed with LD who received support services); age data not reported 54% men, 76% European American	Academic self-regulation	Higher scores on procrastination and avoiding studying were linked with lower GPAs
Norwalk et al. (2009)	IV: Conners' Adult ADHD Rating Scale (Conners et al., 1999) DV: Self-reported GPA	<i>N</i> = 263 (Age <i>M</i> = 20.04, <i>SD</i> = 4.33) 73% women 75% European American	Symptom management	Inattention and hyperactivity/impulsivity did not predict GPA.
Schwanz et al. (2007)	IV: Attention and Hyperactivity subscales of the Behavior Assessment System for Children-College (Reynolds & Kamphaus, 2004) DV: GPA from Registrar	<i>N</i> = 316 Age: <i>M</i> = 20.3, <i>SD</i> = 2.5 59% 1 <sup>st</sup> year students 51% women 84% European American	Symptom management	Attention (explained 7% of variability in GPA) and hyperactivity problems (explained additional 2% of variability in GPA) were linked with lower GPA.
Shmulsky & Gobbo (2007)	IV: Attribution Style Questionnaire (Peterson et al., 1982) DV: GPA from Registrar	<i>N</i> = 42, ADHD group <i>n</i> = 16, LD group <i>n</i> = 12, ADHD and LD group <i>n</i> = 14 No data for sex or ethnicity	Emotional regulation	Optimism and a positive attribution style were related to higher GPA.
Turnock et al. (1998)	IV: Coping Strategies Measure (created by authors to measure academic regulation behaviors) The Survey of Study Habits and Attitudes (Brown & Holtzman, 1965) DV: GPA and enrollment from Registrar	<i>N</i> = 151, high and low symptoms of ADHD (Age: <i>M</i> = 18, no <i>SD</i> provided; range = 16-33) 59% high ADHD symptom group 58% Women 90% European American	Academic self-regulation	Higher levels of procrastination and less goal-setting for those with low ADHD symptoms was related to lower GPAs. Procrastination was not related to GPA for high ADHD symptoms. Time management was marginally related to GPA for those with high ADHD symptoms. More of the higher ADHD symptoms group had dropped out two years later.
Descriptive/Cross-Sectional Design with Comparison Group				
Study	Independent and Dependent Variables	Participants	Predictor Category	Results
Advokat et al. (2011)	IV: Academic Assessment of College Students Questionnaire (created by authors) DV: Self-reported GPA	ADHD group <i>n</i> = 92 (Age: <i>M</i> = 21.1, <i>SD</i> = 1.8) 89% European American; 62% men non-ADHD group <i>n</i> = 143 (Age: <i>M</i> = 21.7, <i>SD</i> = 4.1) 82% European American; 17.5% men	Academic self-regulation	More frequent planning, completing assignments, paced studying before exams were related to higher GPAs. Frequency of class note taking and ability to avoid distractions were not related to GPA.
Chevalier et al. (2017)	IV: Learning and Study Skills Inventory (LASSI); Metacognitive Reading Strategies Questionnaire (Taraban et al., 2000) DV: GPA from Registrar	<i>N</i> = 437. 100% first year international students at Canadian university LD group <i>n</i> = 77, (Age: <i>M</i> = 18.45, <i>SD</i> = 2.18; 53% women)	Academic self-regulation	Greater use of metacognitive reading strategies and study aids was associated with higher GPAs for the LD group.

(continued)

Table 1. Continued.

Study	Independent and Dependent Variables	Descriptive/Cross-Sectional Design		
		Participants	Predictor Category	Results
Hen & Goroshit (2014)	IV: Academic Procrastination Scale (Milgram, Mey-Tal, & Levison, 1998) DV: Self-reported GPA	Non-LD group $n = 295$ (Age: $M = 17.92$ , $SD = 1.09$ ; 66% women) No data on ethnicity LD group $n = 99$ , non-LD $n = 188$ 100% 2 <sup>nd</sup> year students at Israeli university Full sample: Age $M = 25.08$ , $SD = 4.35$ 86% women	Academic self-regulation	Less procrastination was related to higher GPA (self-reported). These findings were stronger for students with LD compared with students without LDs.
Reaser et al. (2007)	IV: Learning and Study Skills Inventory (LASSI) DV: Self-reported GPA	LD group $n = 50$ , ADHD group $n = 50$ , non-LD/ADHD group = 50; no data on age Full sample: 60% men 54% European American	Academic self-regulation	ADHD group: Higher motivation was related to higher GPAs. LD group: Higher levels of anxiety was related to higher GPAs.
Ruban et al. (2003)	IV: Learning and Study Skills Survey (LSSS; created by authors) DV: Self-reported GPA	LD group $n = 53$ (Age: $M = 21.7$ , $SD = 2.2$ ) non-LD group $n = 417$ (Age: $M = 19.9$ , $SD = 1.1$ ) Full sample: 88.7% European American, 58.5% men	Academic self-regulation	Compensatory strategies were negatively correlated with GPA. The use of conceptual skills and memorization was related to higher GPAs. For students with LDs, conceptual skills were more strongly correlated with GPA compared with students without LDs.
Zysberg & Kasler (2017)	IV: Schutte Emotional Intelligence Scale (Schutte et al., 1998) Audio Visual Test of Emotional Intelligence (Zysberg et al., 2011) DV: Self-reported GPA	$N = 584$ (Age $M = 24.32$ , $SD = 4.50$ ) LD group $n = 234$ 100% seniors, 76% women 82% Jewish	Emotional self-regulation	Higher levels of emotional intelligence were associated with higher GPA.
Study	Independent and Dependent Variables	Longitudinal Design Participants	Predictor Category	Results
Bergey et al. (2018)	IV: Extended Satisfaction with Life Scale-Academic subscale (Alfonso et al., 1996) Intrinsic value items DV: 2 <sup>nd</sup> year enrollment from Registrar	$N = 482$ 100% 1 <sup>st</sup> year students at Canadian university LD group $n = 168$ (Age: $M = 18.42$ , $SD = 1.17$ ), 69% women Non-LD $n = 314$ (Age: $M = 18.42$ , $SD = 1.08$ ) 80% women No data on ethnicity	Academic integration	LD group: Perceived effort to attain degree was negatively related to 1 <sup>st</sup> to 2 <sup>nd</sup> year retention
Dvorsky & Langberg (2019)	IV: Barkley Adult ADHD Rating Scale-IV (self- and parent-report; Barkley, 2011); Barkley Deficits in Executive Functioning (self- and parent-report; Barkley, 2011) DV: End of year GPA	$N = 59$ students with each student's parent also providing a report on students' symptoms and behaviors. (Student age: $M = 19.90$ , $SD = 2.75$ ; range = 17–30), 54% men, 71% European American All rigorously diagnosed with ADHD	Academic self-regulation, Emotional regulation, Motivation, ADHD symptoms	Self-reported organization predicted GPA in regression analyses. Self-reported organization and parent-reported emotional regulation positively correlated with GPA.
Frazier et al. (2007)	IV: College ADHD Response Evaluation (Glutting, Sheslow, & Adams, 2002) DV: Academic probation status from Registrar	380 freshmen-parent dyads (Age: $M = 19.1$ , $SD = 0.37$ ) 67% women 80.5% European American	Symptom management	Inattention (both self and parent reported) positively correlated with whether or not students were placed on academic probation (GPA < 2.0).
Glutting et al. (2002)	IV: College ADHD Response Evaluation (Glutting, Sheslow, & Adams, 2002) DV: GPA from Registrar	680 student-parent dyads (Age $M = 19.2$ , $SD = 2.2$ ) 58% women 93% European American	Symptom management	Parent-reported inattention was linked with GPA. Student-reported ADHD symptoms were not linked with end of first-year GPA beyond SAT scores.
Gormley et al. (2018)		ADHD group $n = 175$ non-ADHD group $n = 180$	Academic self-regulation	The use of study skills was related to higher GPAs.

(continued)



Table 1. Continued.

Descriptive/Cross-Sectional Design				
Study	Independent and Dependent Variables	Participants	Predictor Category	Results
	IV: Learning and Study Skills Inventory (LASSI) DV: GPA from Registrar	Full sample: Age $M = 18.23$ , $SD = 0.51$ 51% women 100% Freshmen 71% European American		ADHD group status and the use of institution support services were not related to GPA.
Khalis et al (2018)	IV: Barkley Current Symptom Scale (Barkley & Murphy, 2006) DV: GPA from Registrar	$N = 571$ international 1 <sup>st</sup> year students at Canadian university (Age $M = 18.69$ , $SD = 0.81$ ) 57% men	Symptom management	Self-reported inattention and hyperactivity/impulsivity symptom total was negatively correlated with GPA.
Langberg et al. (2014)	IV: Pediatric Daytime Sleepiness Scale (Drake et al., 2003) Barkley Adult ADHD Rating Scale-IV (Barkley, 2011) DV: GPA and # of Ds and Fs (source unclear)	$N = 62$ 100% comprehensively diagnosed with ADHD Age $M = 19.50$ , $SD = 2.46$ 52% 1 <sup>st</sup> year students 71% European American Proportion of biological sex not provided	Symptom management	Self- and parent-reported ADHD symptoms and self-reported daytime sleepiness did not predict end of year GPA. For students with GPA < 2.0, daytime sleepiness predicted GPA. For the total sample, daytime sleepiness predicted earning more Ds and Fs.
Study	Independent and Dependent Variables	Intervention Design Participants	Study Design	Results
Scheithauer & Kelley (2017)	IV: intervention group assignment (intervention 1: study skills, goal setting and self-monitoring; intervention 2: study skills and goal setting) DV: Standardized GPA calculated based on self-reported grades earned on all assignments during intervention semester	$N = 52$ with previous diagnosis of ADHD and all taking ADHD medication Age $M = 20.48$ , $SD =$ not reported 22% first year students 76% women 80% European American Intervention 1: $n = 27$ Intervention 2 $n = 25$	Academic self-regulation	Students in the intervention that included self-monitoring skills (e.g., track class attendance, checking planner, medication adherence) earned higher GPAs compared with students in the intervention without self-monitoring skills.

Note. IV = Independent variable, DV = Dependent variable, GPA = Grade point average, ADHD = Attention-Deficit/Hyperactivity Disorder, LD = Learning Disorder or history of reading difficulties, M = mean, SD = standard deviation, SAT = Scholastic Aptitude Test. All IVs were collected via college student self-report unless noted otherwise.

procrastination, perceiving value in attaining a degree, and higher motivation were associated with college success for students with LD or a history of reading difficulties.

### Study skills

Researchers used a cross-sectional study design to compare the relation between academic self-regulation and GPA for students with a documented LD ( $n = 53$ ) and those without an LD ( $n = 417$ ; first-years through fourth-years).<sup>40</sup> All participants completed an instrument developed by the authors, Learning and Study Skills survey (LSSS), which is designed to assess the frequency and perceived effectiveness of using conceptual skills (e.g., understanding concepts, synthesizing across concepts, analyzing concepts), memorization skills (e.g., rote memorization study strategy use), and compensatory strategies (e.g., recording lectures, using audiobooks). Academic self-regulation skills for students in the LD group explained 43.75% of the variability in GPA, with the use of conceptual skills showing the strongest relation with GPA ( $\beta = 0.55$ ). Additionally, in the same study, using memorization, fewer compensatory strategies, and perceiving those strategies as useful were associated with higher GPAs. The relation between using study skills and GPA was mediated

by perceived usefulness (i.e., students use these skills when they expect them to be effective learning strategies).<sup>40</sup> Further, in a cross-sectional study examining study habits in those with and without ADHD, paced studying before tests was related to higher GPAs for students with ADHD, regardless of medication status.<sup>41</sup> In the same study, GPA was not related to study skill use or in-class note taking for students without ADHD, although students with ADHD reported similar study skill use compared to non-ADHD students.

Learning strategies and study skills, as measured by the Learning and Study Skills Inventory (LASSI),<sup>42</sup> have been shown to be linked to GPA for students with LD and ADHD in two and one study, respectively. In a cross sectional study, the total LASSI score accounted for 22% of the variability in GPA ( $R^2 = 0.22$ ; first-years through fourth-years included) for those with LD.<sup>43</sup> In a longitudinal study including only first-year students, the use of study skills as measured by the LASSI was positively related to GPA at the end of student's first year for students with elevated ADHD symptoms and parent education level below master's level.<sup>44</sup> In a cross-sectional study, the LASSI subscales were analyzed separately when examining relations with GPA for students with a history of reading difficulties.<sup>45</sup> Analyses indicated

the use of study aids (“use of aids that support meaningful learning and retention,” p.35) and metacognitive reading strategies to enhance comprehension were positively related to GPA, while reviewing class materials was negatively related to GPA (full model accounted for 16.5% of the variability in GPA).<sup>45</sup> However, other learning strategies included in the model (e.g., self-testing, selecting main ideas, more in-depth information processing strategies) were not linked with GPA.

### ***Procrastination, time management, and motivation***

How students use their time outside of class has been linked with GPA and persistence in college. For students with high ADHD symptoms (greater than 10 out of 18 symptoms of inattention and hyperactivity/impulsivity), time management skills have been found to be marginally related to GPA, while there has been a stronger relation for students with low levels of ADHD symptoms (4 or fewer symptoms).<sup>46</sup> In the same cross-sectional survey study, higher reported levels of procrastination were linked with poorer GPAs only for students in the low ADHD symptom group, whereas procrastination was not related to GPA for those with high ADHD symptoms.<sup>46</sup> For students with ADHD, planning out when to complete assignments and executing this plan were also positively linked with GPA in a cross-sectional study.<sup>41</sup> Similarly, in a longitudinal study with 59 students rigorously diagnosed with ADHD, organization partially mediated the relation between ADHD symptom severity and end of spring semester GPA, as decreased motivation in the beginning of the school year was linked with lower GPAs.<sup>39</sup>

Teaching college students with ADHD how to systematically monitor their behaviors may also improve academic performance, as indicated by one intervention study in which students were randomized to either receive instruction on study skills, goal setting, and self-monitoring (experimental condition) or on just study skills and goal setting (control condition). In the study, students who learned how to observe and track their behaviors related to academic performance (i.e., self-monitoring) in addition to learning study skills and goal setting ( $n=27$ ) had higher GPAs and reported fewer ADHD symptoms at posttest compared with students who only received training in study skills and goal setting ( $n=25$ ).<sup>47</sup> Students in the self-monitoring group were instructed to complete an individualized self-monitoring progress sheet daily on their daily tasks to improve task completion. Accountability check-ins were provided by the group leaders every two to four days to increase the likelihood students were engaging in self-monitoring. One notable limitation was the lack of controlling for baseline differences in GPA, although significant within group improvements were found for students in the self-monitoring group and not for students who did not receive self-monitoring training.<sup>47</sup>

Mixed results have been found related to procrastination and time management for students with LD or those with a history of reading difficulties. In a longitudinal study, high reports of procrastination at the beginning of the first year was linked with lower GPAs at the end of the first year for

students diagnosed with an LD ( $N=84$ ).<sup>48</sup> However, procrastination was not a strong predictor of GPA in this study, as this factor accounted for 5% of the variability in GPA. In contrast, in a study with Israeli college students, higher self-reported GPA was linked with less procrastination,<sup>49</sup> although these students were older ( $M$  age = 25.08) compared with North American college samples (age = 18–21).<sup>41,44</sup> Time management at the beginning of the semester, as measured by the LASSI in a large sample of first-year students, was unrelated to end of year GPA for students with a history of reading difficulties.<sup>45</sup>

For students with ADHD, motivation was identified as a factor that was linked with GPA in one cross-sectional study,<sup>43</sup> while it was not linked with GPA in a longitudinal study.<sup>39</sup> In the cross-sectional study, a clinical sample of college students diagnosed with ADHD ( $n=50$ ; 25% first-year students) reported lower levels of motivation (using the LASSI) compared to non-diagnosed peers ( $n=50$ ).<sup>43</sup> Further, regression analyses within this study revealed motivation as a significant predictor of GPA, as increased motivation was linked with increased GPAs.<sup>43</sup> In the prospective longitudinal study with students with ADHD ( $N=59$ ; 45.8% first-year students), low motivation at the beginning of the year (as measured by the Barkley Deficits in Executive Functioning Scale) was linked with subjectively high levels of self-reported impairment, but was not linked with GPA at the end of .<sup>39</sup> For students with LD ( $n=50$ ) in the cross-sectional study, motivation was not linked with GPA.<sup>43</sup> Students with LD were not included in the longitudinal study that included motivation as a predictor of GPA.<sup>39</sup>

### ***Academic self-efficacy***

Academic self-efficacy, feeling competent, and having the skills and abilities necessary to perform academic tasks, was positively associated with GPA for students with ADHD and LD in three studies. Students with an LD report lower levels of self-efficacy for completing academic tasks, which has been shown to increase procrastination and may lead to poorer academic performance.<sup>51</sup> In a cross-sectional study with second-year students with and without LD, lower levels of academic self-efficacy (e.g., feeling competent and confident in using computers, accessing resources, participating in class discussion, understanding course assignments) were linked with lower self-reported GPAs.<sup>49</sup> In this study, the relation with GPA was stronger for students with LD, indicating that feeling competent and believing in the effective use of study skills may be more critical to college success for students with LD.<sup>49</sup> Similarly, in a longitudinal study that included first-year students with a history of reading difficulties, participants' academic self-efficacy at the beginning of the school year predicted both end of year GPA (accessed from the registrar) and second-year enrollment.<sup>50</sup> Finally, in a cross-sectional study with a combined ADHD and LD sample ( $N=68$ ; first-years through fourth-years included), academic self-efficacy was positively related to self-reported GPA.<sup>52</sup>

### Emotional regulation

Emotional characteristics may also play a role in academic performance for students with LD and/or ADHD, as four studies included a measure of emotional regulation as a predictor. In a sample of Israeli college students receiving support services for an LD ( $n=99$ ), the relation between procrastination and GPA was mediated by emotional intelligence (emotional awareness, ability to modulate emotions), such that higher levels of reported emotional intelligence was associated with less procrastination and higher GPAs.<sup>49</sup> A similar relation was found in a cross-sectional study using an objective measure of emotional intelligence (performance-based task) was related to GPA in a different sample of Israeli college students with learning disabilities.<sup>53</sup> These students' ability to accurately identify and analyze emotions presented in pictures and video clips was positively correlated with self-reported cumulative GPA, after accounting for SAT scores.<sup>53</sup> Further, in a combined sample of students diagnosed with ADHD and a comorbid LD at an institution for students with ADHD, LD, and/or an autism spectrum disorder, a positive attributional style was correlated with higher GPAs, indicating optimism related to academic tasks may be predictive of college success.<sup>54</sup> Finally, in a longitudinal study, self-reported deficits in emotional regulation during the beginning of the school were correlated with lower GPAs.<sup>39</sup>

### Symptom management

Mixed findings were found for links between ADHD symptoms and GPA, as four studies found ADHD symptoms predicted GPA and two studies did not find such relation. In both a prospective longitudinal ( $N=680$ )<sup>55</sup> and cross-sectional study ( $N=380$ ),<sup>25</sup> more symptoms of inattention (e.g., being easily distracted, making careless mistakes, difficulty sustaining attention) were negatively correlated with GPA in first-year college students. In the cross-sectional study, both student- and parent-reported higher levels of inattention were linked with GPAs below 2.0 (as reported by the university).<sup>25</sup> However, in this same study, background characteristics such as high school GPA and SES were not included in analyses. Similarly, in a different cross-sectional study that included only student reported symptoms in a non-clinical sample ( $N=316$ ), difficulties with attention explained 7% of the variability in GPA, while hyperactivity problems added 2% of the variability in GPA.<sup>56</sup> In a longitudinal study with first-year international students attending a university in Canada ( $N=571$ ), higher levels of self-reported combined inattention and hyperactivity/impulsivity symptoms at the beginning of the first year predicted lower GPAs at the end of the year.<sup>57</sup> In contrast, in a cross-sectional (non-clinical sample;  $N=263$ ) and longitudinal studies (clinical ADHD sample;  $N=59$ ) with students who ranged from first to fourth year students, no significant associations between self-reported inattention symptoms and GPA were found.<sup>58,59</sup> However, in both studies, inattention was linked with subjective measures of academic and social adjustment.<sup>58,59</sup>

In addition to links with ADHD symptoms, academic achievement in college may be associated with sleep difficulties, as was found in one study. In a prospective longitudinal study that included a sample of college students with an evidence-based assessment for ADHD ( $n=68$ ), daytime sleepiness predicted earning more Ds and Fs and lower GPA above and beyond ADHD symptoms (for those with GPA < 2.0).<sup>59</sup> However, factors that are related to sleep and GPA, such as alcohol use were not accounted for in this study.

### Academic and social integration

DaDeppo<sup>31</sup> examined the association between academic and social integration and GPA in first- and second-year students with a documented LD ( $N=97$ ). In this study, social and academic integration was measured using a part of a first-year survey that included items such as participating in campus clubs or recreation activities and feeling homesick (social integration) and discussing the course material with faculty or peers and completing assignments on time (academic integration). After accounting for high school GPA, SAT scores, race, and SES (which accounted for 19% of the variability in GPA), academic and social integration did not explain a significant amount of additional variability in GPA ( $\Delta R^2 = 0.02$  and 0.0, respectively).<sup>31</sup> In terms of retention, in a longitudinal study with first-year students who reported a history of learning difficulties, academic integration (as measured by academic satisfaction) was not predictive of second-year enrollment.<sup>50</sup>

For students with ADHD, better social integration may predict better first-year adjustment to college, as was found in one longitudinal study. In this study, international students attending a large public university in Canada reported on current ADHD symptoms and completed sociometric measures on reciprocated friendships and social acceptance in a two-week orientation setting.<sup>57</sup> For students who reported high levels of ADHD symptoms (> 1 SD above mean levels of combined inattention and hyperactivity/impulsivity), more reciprocated friendships were linked with fewer internalizing symptoms and higher levels of attachment to the university. Social acceptance and reciprocated friendships for students with high levels of ADHD was not related to GPA at the end of the first year.<sup>57</sup> However, the participants in the sample were not clinically diagnosed with ADHD, so it is unclear whether social integration is predictive of GPA for first-year students with a true ADHD diagnosis.

The relations among academic and social integration and persistence were also examined for students with LD in one study. A cross-sectional design included a measure of student-reported intentions to continue college enrollment from the spring to fall semesters of first- and second-year students.<sup>31</sup> After accounting for sex, race, SES, SAT score, and high school GPA, social and academic integration were significant predictors of students' intent to persist (accounted for 18% and 12% of the variability in intent to persist, respectively).<sup>31</sup>

## Discussion

### Summary of findings

In sum, 21 articles were identified that examined potential predictors of academic success for students with ADHD and/or LD. All articles included GPA as an outcome variable, while two studies included measures of student persistence. Included studies were cross-sectional (with and without non-diagnosed comparison groups  $n = 13$ ) and longitudinal ( $n = 7$ ), with one intervention study. Potential treatment targets that were linked with GPA and persistence for students with an LD or a history of reading difficulties included the use of study skills, procrastination, self-monitoring, motivation, academic self-efficacy, emotional regulation, and academic and social integration. Potential treatment targets that were linked with GPA and persistence for students with ADHD, included study skills, planning, time management, procrastination, motivation, academic self-efficacy, management of inattentive symptoms, and social integration.

### Comparison with typical college students

The current findings are mixed when compared with predictors of college success for typical college students. For typical college students, academic self-regulation (i.e., discipline, effort toward academic work) explained the most variability in GPA, followed by motivation, study skills, and academic integration (commitment to college).<sup>60</sup> After accounting for ACT scores, demographic characteristics, and institutional characteristics, these predictors accounted for 3.4% of the variability in first-year GPA. Academic regulation and integration best predicted first to second-year retention, followed by motivation and social integration. Academic self-efficacy was not related to academic performance or retention.<sup>60</sup> Based on the current review and comparable to typical college students, behaviors related to academic self-regulation were predictive of success for students with ADHD and/or LD. In contrast to typical college students, academic self-efficacy, or the belief and confidence in one's ability to complete academic tasks, was associated with college success. Similarly, emotional regulation was linked with GPA for students with LD and for those with ADHD.<sup>39</sup> No studies have been conducted examining emotional regulation and retention in students with ADHD and/or LD.

### Academic self-regulation

Students with ADHD and/or LD typically begin college with less well-developed academic skills and regulation compared with their peers.<sup>44,50</sup> The use of these skills may be more critical for college success, as the positive correlation between more in-depth learning strategies and GPA was stronger for the LD group compared with the non-LD group.<sup>40</sup> Being able to discern the most important information from readings, processing the information at a deeper level, and synthesizing concepts may allow students to learn course material. Time management and planning skills may be more important for students with ADHD and/or LD

because academic tasks take longer to complete. These skills deficits add to higher academic demands (e.g., a greater volume of reading) which leads to lower GPAs.

For students with ADHD and LD, poor motivation has been shown to hinder completing academic work.<sup>61</sup> For those with ADHD, poor motivation may be related to executive functioning deficits (i.e., deficits in delaying gratification, which lowers motivation toward a long-term goal).<sup>62</sup> College students with ADHD may have difficulty completing aversive tasks when faced with a competing activity that is more desirable (e.g., choosing to socialize instead of completing homework). This may be exacerbated by the dramatic increase in unstructured time and decrease in monitoring from parents and teachers as students transition from high school to college. An intervention that includes self-monitoring has shown promising effectiveness at improving academic performance, as well as others that have included specific strategies to improve motivation (e.g., using rewards and accountability partners).<sup>47,63</sup>

### Academic self-efficacy and emotional regulation

Students with ADHD and/or LD have faced academic challenges throughout their lives and therefore they may have decreased confidence in their abilities to complete academic tasks. The college setting presents additional challenges related to completing academic tasks with less structure. Academic self-efficacy has been shown to be more strongly related to GPA for students with LD compared to students without LD,<sup>49</sup> indicating interventions to improve confidence in completing academic tasks may improve college success.

Students with ADHD and/or LD typically take longer to complete academic tasks than typical students, which may cause an increase in the frequency and intensity of negative emotionality (e.g., frustration, anxiety about grades). This frequent need to modulate negative emotions may lead to greater frustration and decreased motivation. Those with ADHD and/or LD have higher rates of emotion dysregulation<sup>62</sup> and are at higher risk for internalizing disorders.<sup>26</sup> Thus, being able to regulate emotions effectively may be even more important for these students' completion of academic tasks.

### ADHD symptom management

For college students with ADHD, inattention severity is associated with academic impairment.<sup>25,55</sup> Additionally, self-reports of daytime sleepiness negatively impact academic performance.<sup>59</sup> Whereas parents and teachers may have helped the student remain organized, stay motivated to complete tasks, and stay on task while in high school, students with ADHD must be independent learners in college. Parents were also in a role to help their high school student structure their sleep schedules. This abrupt loss of structure in the first year of college, coupled with executive functioning deficits related to the disorder may make it more difficult for students to integrate academically. College students may be less apt to engage in activities related to academic tasks thoroughly (e.g., discussing course material outside of class, using



adequate study skills), which then may negatively impact academic integration and GPA, and persistence.

### **Academic and social integration**

For typical college students, social integration has not been shown to be predictive of first-year GPA but has been linked with persistence.<sup>15</sup> For college students with elevated ADHD symptoms, social integration has been related to first to second-year retention, but not associated with GPA. However, social integration was related to both retention and GPA for students with LD. Low social acceptance in adolescents with ADHD has been linked with low GPA and may moderate the relation between inattention and GPA.<sup>64</sup> This relation may extend into college; therefore, building a social support system once beginning college may be especially important to first-year adjustment for students with ADHD.

Academic integration (e.g., investment in academic goals; contact with course instructors in and outside of the classroom) has also been associated with GPA and persistence in typical college students. For students with a history of reading difficulties, academic integration was not linked with first to second-year retention,<sup>50</sup> but has been linked with retention for students with LD.<sup>31</sup> Given these mixed findings, and that no studies were identified that directly examined academic integration in students with ADHD, it is unclear whether academic integration significantly impacts college success for this group.

### **Implications for treatment**

Often, college students with ADHD and/or LD use medication and/or university support services (e.g., academic accommodations). However, when included as potential predictors in the studies in the current review, the use of these interventions have not been related to GPA.<sup>41,44</sup> By identifying factors that are related to critical markers of college success (i.e., GPA and retention), more targeted interventions that include these factors may improve academic performance. Cognitive behavioral interventions that emphasize teaching study skills, time management, and organization skills have shown to reduce ADHD symptoms and impairment yet have had minimal impact on GPA.<sup>63,65</sup> The current systematic review has provided additional evidence that the particular components should be considered when tailoring interventions. Based on the robust methodological rigor of the longitudinal studies included, academic self-regulation, academic integration, emotional regulation, and ADHD symptom management emerged as strong predictors of GPA and retention. More specifically, interventions may target: learning and implementing study skills, overcoming procrastination and enhancing motivation to complete aversive tasks, self-monitoring of academic tasks, building confidence in academic abilities, learning and implementing emotional regulation strategies, and encouraging the development of a social support system in college.

### **Limitations and future directions**

The current review has identified some important intervention targets for students with ADHD and/or LD; however, there are

several shortcomings. First, several studies included samples of mainly white women. Additionally, when samples included more balanced proportions of men and women, analyses were not conducted by sex to determine possible differences in predictors of college success (see *BLINDED FOR REVIEW*<sup>66</sup> for data analytic bias). Therefore, caution must be used when generalizing to men and students of different ethnic backgrounds. Disparities exist for the diagnosis and treatment of ADHD and LD in ethnic minority students and levels of academic self-efficacy compared with white students.<sup>52,67</sup> Future studies should be designed to include more ethnically diverse samples of students with ADHD and LD as well as more men. This might be accomplished by identifying collaborators at more diverse universities and recruiting participants outside of psychology classes (e.g., business, engineering).

In addition to the limitations of included studies, there are limitations inherent in conducting systematic literature reviews. Relevant studies may have not been included because we only considered English-language studies. Other studies may have been excluded, as relevant manuscripts may not yet have been published. Although our literature search was systematic and thorough, there may have been other psychological predictors of GPA and retention that we did not include because they have not been identified as relevant for college success in this population. However, the current systematic review as the only review to examine psychological predictors of GPA and retention, provides support for including academic regulation, academic self-efficacy, symptom management, emotional regulation, and academic and social integration.

There have been recent calls for increasing the methodological rigor of studies examining factors that predict success for students with disabilities.<sup>68</sup> Studies examining potential predictors of GPA and retention should account for student background characteristics, including parent education/SES, high school GPA, and SAT/ACT scores. These characteristics have accounted for approximately 20% to 35% of the variability in GPA.<sup>15,19</sup> These background characteristics should be included to determine the incremental variability explained by characteristics internal to the student. Further, most of the studies reviewed examined predictors in relative isolation. Factors such as motivation, academic self-efficacy, and emotional regulation are related. Future studies should include multiple predictors of college success to determine interrelations and the factors that display the most significant influence. Several predictors have not been examined in students with ADHD and/or LD (e.g., emotional regulation, goal-setting, and mindset, locus of control, personality traits).<sup>19</sup> Finally, just 2 out of 21 studies included a measure of retention as an outcome variable. Therefore, it remains unclear as to the factors that are related to persistence for students with ADHD and/or LD.

### **Conclusion**

Students with ADHD and/or LD are enrolling in postsecondary education settings at higher rates, yet their graduation rates remain low. This review identified several malleable targets for intervention, including academic self-regulation, academic self-efficacy, emotional regulation, ADHD symptoms,



sleep quality, and academic/social integration, suggesting possible approaches to enhance success in college.

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