A Literature Review of Academic Interventions for College Students With Learning Disabilities

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Abstract
The number of students with learning disabilities (LD) enrolling in postsecondary education has increased rapidly over the past decade. It is imperative to investigate what interventions have been used to assist students with LD in achieving academic success. To examine the interventions currently used to support students with LD in postsecondary education, the authors reviewed the relevant literature from 2000 to 2016. Four primary types of interventions were identified from 12 articles: assistive technology, direct assistance, strategy instruction, and comprehensive support program. The findings indicate that the student-centered approach is an important characteristic of current academic interventions for students with LD in postsecondary education. The authors also provide implications for researchers and practitioners for improving postsecondary interventions on students with LD.

Keywords
postsecondary education, learning disability, interventions, academic success

There are growing enrollments of students with learning disabilities (LD) in postsecondary education due to the passage of key legislation, such as the Individuals With Disabilities Education Improvement Act (IDEIA) of 2004, the Americans With Disabilities Act Amendment Act of 2008, and the 2008 Higher Education Opportunity Act (Ancitl, Ishikawa, & Scott, 2008; Raue & Lewis, 2011). Between 1998 and 2012, the percentage of students with disabilities in postsecondary schools has increased from 6% to 11% of all college students (Lewis, Farris, & Greene, 1999; Snyder, De Brey, & Dillow, 2016). Of the total number of college students with disabilities, 31% were categorized as having LD in 1998 in comparison with 61% in 2011 (Lewis et al., 1999; Newman et al., 2011). This percentage may not reflect the actual number of college students who have LD because many students do not disclose their disability status when they enroll in college (Cortiella & Horowitz, 2014). Given that a greater number of students with LD are enrolled in postsecondary education, interventions for students with LD will also be in increasing demand in postsecondary education (Cawthon & Cole, 2010; Orr & Hammig, 2009).

Students with LD generally experience cognitive processing deficits that are manifested in their difficulties with information processing, which influence their academic performance on writing, reading, memorizing, understanding course material, and testing (Gregg, 2007; Heiman & Precel, 2003). Due to these substantial difficulties, students with LD often experience less academic success than students without disabilities. Academic success is often defined by outcomes such as acquisition of academic skills (e.g., skills in reading, writing, and mathematics), grade point average (GPA), retention rates, and college completion rates (DaDeppo, 2009; York, Gibson, & Rankin, 2015). Researchers frequently find discouraging academic outcomes in postsecondary education for students with LD. For example, a report from the National Center for Learning Disabilities showed that the college graduation rate for individuals with LD is 41% compared with 52% among individuals without disabilities (Cortiella & Horowitz, 2014). More recently, McGregor et al. (2016) interviewed a group of postsecondary students with LD, who reported that their poor academic skills impeded their learning and postsecondary experience.

Complying with aforementioned legislation, postsecondary institutions often provide many academic support programs for students with LD to alleviate their academic risk and improve their academic success (Fullarton & Duquette, 2016). However, there are still many students...
with LD who do not benefit from these supports. One reason is the lack of self-disclosure of disabilities, which affects the eligibility to the entitled support and services. A study indicated that only 24% of students, who received special education services in high schools, disclosed their disabilities to postsecondary schools (Cortiella & Horowitz, 2014). Many students do not self-disclose their disabilities or solicit supports until they are in danger of academic failure (Farmer, Allsopp, & Ferron, 2015; Richman, Rademacher, & Maitland, 2014).

Another factor contributing to the underuse of the disability and support services is that most accommodations and general supports are focused on students’ disabilities or diagnosis rather than addressing students’ contextual and functional needs (Cooper, Lingo, Whitney, & Slaton, 2011; Kurth & Mellard, 2006). These contextual features are important for a student’s academic success, such as physical and environmental qualities, cultural background, and social relationships (Dunn, Brown, & McGuigan, 1994). Postsecondary institutions provide various forms of instruction (e.g., blending learning, laboratory courses, traditional lectures, etc.) and extensive options for course subjects, which requires students to adjust to the different learning environments or academic contexts. However, students with disabilities often have difficulties in taking advantage of contextual features to promote their performance, due to information processing difficulties (Dunn et al., 1994; Swanson, 1987).

In addition to contextual needs, students with LD also have functional needs. Students with LD often display difficulties with phonological and executive processing, which affect their decision making, planning process, self-regulatory process, and problem solving (Meltzer & Krishnan, 2007). Researchers have noted that general accommodations are designed to alter learning environment of students with disabilities to compensate for their skill deficiencies, rather than enhance students’ executive function processes (Kurth & Mellard, 2006; Thurlow, Ysseldyke, & Silverstein, 1995). Also, some interventions, such as reviewing course content during tutoring or remedial courses, are not sufficient to develop students’ executive function skills (Cooper et al., 2011; Rath & Royer, 2002). Furthermore, when students merely rely on accommodations and support from others (e.g., tutors, intervention specialist), they are less likely to apply their executive function skills to improve their learning experience in independent settings (Cooper et al., 2011; Rath & Royer, 2002).

A growing body of literature demonstrates that LD interventions can improve academic success for students with LD. Two reviews provide research syntheses on LD interventions in the postsecondary education through 2000. Rath and Royer (2002) identified two approaches used by postsecondary LD services based on whether the intervention changed the learning environment or students made an effort to promote their learning. Mull, Sitlington, and Alper (2001) examined student and institution characteristics, service characteristics, and staff training and evaluation characteristics in the literature. They found that 65% of articles recommended instructional learning strategies in addressing students’ deficits in academic skills, and the necessity of teaching self-advocacy skills.

The previous literature reviews have shed light on general services and interventions for supporting postsecondary students with LD; however, over the past 16 years, students with LD still face some unique challenges and have a lower rate of academic success than their peers without disabilities. Promoting postsecondary educational attendance and outcomes for students with disabilities has been emphasized by latest federal legislations, including the Workforce Innovation and Opportunity Act of 2014 and the reauthorization of the Higher Education Act in 2008 (Campbell & Love, 2016; National Council on Disability, 2015). In particular, individuals with disabilities are offered greater postsecondary educational opportunities to engage in academic training. More research has been conducted and reported in the past 16 years. Therefore, a more recent literature review is warranted to examine emerging interventions for students with LD.

The purpose of this article is to provide a comprehensive review of interventions for students with LD in postsecondary education. In this review, we aim to explore the following research questions:

**Research Question 1:** What types of academic interventions for supporting students with LD in postsecondary education are being studied by researchers?

**Research Question 2:** How do interventions impact academic success of students with LD in postsecondary education?

In this review, we define the *intervention* as a practice to help students build target skills or support students to achieve progress in academic areas. Meanwhile, we operationally define *academic success* in terms of completion of postsecondary education, higher GPA, acquisition of knowledge, and academic skills and competencies (York et al., 2015).

**Method**

An extensive search was conducted via the following online databases: Education Resources Information Center (ERIC), Academic Search Complete, Education Research Complete, PsycINFO, Psychology and Behavioral Sciences Collection, and Education Full Text (H. W. Wilson), using the following keywords: *learning disability, learning problem, learning difficulty, strategy, service, program, intervention, support, university, postsecondary, college,* and,
higher education. The wildcard was applied to design keywords search strategy to combine learning disa* or learning problem* or learning difficult* with the following terms: strategy* or service or program or intervention or support AND universit* or postsecondary or college or higher education. The reference lists of the included articles were examined to identify relevant studies.

The selection criteria for inclusion in this review were empirical studies that (a) used quantitative, qualitative, or mixed methods; (b) were published in peer-reviewed journals between 2000 and 2016; (c) included participants with LD who were attending or attended a 2-year or 4-year postsecondary institution; (d) described an intervention or a program to improve students’ academic performance, and (e) that occurred in the United States and Canada. The exclusionary criteria aimed to further refine the articles. Studies that were excluded focused on (a) staff, faculty, or service providers in postsecondary education; (b) general disabilities instead of LD; (c) students in a virtual learning environment; and (d) factors or predictors contributing to academic success and characteristics of individuals with LD in postsecondary education.

Online databases searches yielded a total of 1672 articles after entering keywords. The first author conducted the initial screening, and identified 96 articles that were relevant to the association between academic interventions and academic success of students with LD in postsecondary education. In the second round of screening, each abstract of 96 articles was read by two authors to determine whether or not the article met inclusion criteria. If the abstracts were too vague to provide information to make a decision, the full text of studies was obtained to review. We calculated interrater reliability by taking the number of agreements divided by the number of agreements plus the number of disagreements, multiplied by 100%. The interrater reliability was 97.9% for the first and second authors and 95.8% for the first and third authors. Interrater reliability was not obtained between the second and third authors due to no overlap of articles. All differences were then discussed and the consensuses were reached. A total number of 12 articles (see Table 1) were identified to include in this literature review.

To answer the research questions, we employed the content analysis approach to identify categories of interventions in the literature. Two authors reviewed 12 articles and entered each study’s information (e.g., sample, study design, and findings) into a data analysis table. We coded each study based on how an intervention was delivered and what support or training was provided. Four intervention categories were emerged: assistive technology, direct assistance, strategy instruction, and comprehensive support program. Studies of using a technological device or system which (e.g., recorder, voice recognition software) support or improve functional capabilities of individuals with disabilities were assigned to the category of assistive technology.

Direct assistance was defined as providing individualized, content-specific assistance to students in a variety of academic courses. Interventions for teaching or expanding skills in planning, organizing, and memorizing on a task that associated with students’ underlying academic difficulties in the areas of writing, reading, testing, and mastery of information were categorized as strategy instruction. Furthermore, we referred to comprehensive support program as support services that encompassed multiple types of interventions, in which students received group and individual instructions concurrently.

Results
We found 12 articles that met inclusion criteria for investigating academic interventions designed to improve the academic success of students with LD in postsecondary education. The majority of articles (75%) described specific practices to help students achieve academic success, such as the use of assistive technology, strategies to improve academic skills, and strategies to reinforce personal strengths. Other articles (25%) were about comprehensive support programs. All of the reviewed studies were categorized into four groups: assistive technology (16.7%), direct assistance (8.3%), strategy instruction (50%), and comprehensive support program (25%).

Of the 12 articles, there were one qualitative case study, two mixed methods studies, four single-subject studies, and five quantitative studies. All participants were students in postsecondary education. Sample sizes ranged from three to 969. A majority of the studies (75%) had a sample size less than 50. Three studies had a sample size more than 261, and two of them were categorized as a comprehensive support program (i.e., Harrison, Areepattamannil, & Freeman, 2012; Troiano, Liefeld, & Trachtenberg, 2010). The mean sample size for studies in the comprehensive support program and direct assistance categories was 447. The mean sample sizes for studies in the categories of assistive technology and strategy instruction were less than 15. Most of the studies were conducted in the United States, except three studies from Canadian institutions. One study specifically was focused on African American students (Nicholas, Menchetti, & Nettles, 2005).

Assistive Technology
The most common application of the assistive technology found in our review was for researchers to compensate for students’ difficulties with reading and writing with devices. The form of assistive technology utilized in these studies was often a device or product system, which was modified or customized to address the academic difficulties of individuals with disabilities (Martinez-Marrero & Estrada-Hernandez, 2008). Speech synthesis systems (i.e., text-to-speech) and
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| Butler, Elaschuk, and Poole (2000) (SI) | A multiple case studies within a pre–post test design | A college | 3 college students with LD | Strategic Content Learning (SCL) Instruction | • New writing strategies developed by SCL can be transferred to complete tasks outside of intervention sessions by participants  
• Increased metacognitive knowledge and the scores of the metacognitive questionnaire  
• Improved ability to identify and recall pairs and trios of information  
• Improved learning involvement through mastery-oriented learning  
• Increased the number of correct answers to comprehension questions  
• 83% participants’ non-overlapping data points scores indicated a moderate intervention effect to increase reading test scores  
• The intervention achieved mixed benefits with some students performing better whereas others had slight improvements  
• Gained higher mean scores compared with participants who were in the traditional instruction condition on immediate and delayed tests  
• Improved reading comprehension, especially on delayed recall on compare-and-contrast text structures  
• 82.9% of participants stated that the LOTF had contributed significantly to their academic success  
• No students in the LOTF had dropped out of school  
• Improvement in following abilities: understand own LD, explain LD to others, and advocate for themselves  
• The PIRATES strategy greatly affected the performance prompts across the intervention and follow-up phases  
• Reduced levels of test anxiety  
• The average GPA for students, who had four or less absences to tutoring sessions, was higher than for students who had five or more absences  
• Improvement in following areas: ability to understand and master content of particular course, study preparation skills, knowledge of individual learning styles, and disability characteristics of success academic skills |
ClassMate Reader (HumanWare Group, 2005–2012) | |
| Floyd and Judge (2012) (AT) | A multiple baseline design | A public university | 6 college students with LD | |
| Harrison, Areepattamannil, and Freeman (2012) (CSP) | A survey design | Both university and college | 969 college students with LD | Learning Opportunities Task Force (LOTF) Program | |
| Holzer, Madaus, Bray, and Kehle (2009) (SI) | A multiple baseline design | A public university | 5 college students with LD | The PIRATES Strategy (Hughes, Schumaker, Deshler, & Mercer, 1993) | |
| Lock and Layton (2008) (DA) | A mixed methods design | A public university | 530 college students with LD | Individualized Tutoring | (continued)
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| Nicholas, Menchetti, and Nettles (2005) (SI) | An experimental design | A public university | 36 African American college students with LD | Structured Writing Strategy | • No significant difference in Holistic Scoring Rubric for writing quality or writing self-efficacy between training group and nontraining group  
• Improved use of Supporting Details in expository essays compared with the general training participants |
| Patwa, Chafouleas, and Madaus (2005) (SI) | A multiple baseline design | A public university | 5 college students with LD | Paired Associates Strategy (Bulgren, Hock, Schumaker, & Deshler, 1995) | • Students' performances presented a positive increasing trend, and more items correctly answered  
• 60% of participants consistently used the PAS after intervention |
| Reed et al. (2009) (CSP) | A quasi-experiment design | A large urban university | 27 college students with LD | Individualized Success Courses | • Improved self-efficacy and academic resourcefulness in the course- and high-intervention groups  
• Reduction anxiety among three study groups  
• 88% of the course- and high-intervention groups had a GPA at least 2.33, and 36% of the low intervention group achieved at least 2.33 |
| Stodden and Roberts (2005) (AT) | A mixed methods design | A university and 2-year colleges | 15 college students with LD | Voice Recognition Software (VRS)—a compensatory strategy | • It is not clear if the VRS would increase a grade-level equivalency of the writing or not due to small sample size and more than half of participants did not use VRS to complete tasks  
• Variables affecting usage of VRS: time, ease of use/ acquisition of skills, personal issues, use of Standard English, disability, and having other compensatory strategies in place |
| Troiano, Liefeld, and Trachtenberg (2010) (CSP) | A correlational design | A private 4-year college | 262 college students with LD | Individualized Learning Support | • Students with higher usage of learning support had higher GPAs, and the majority of students with GPAs over 3.5 compared with students who had low attendance in learning support service  
• A higher mean on the learning support dimension |

Note. SI = strategy instruction; LD = learning disabilities; AT = assistive technology; DA = direct assistance; PAS = paired associates strategy; CSP = comprehensive support program; GPA = grade point average.
voice recognition software (i.e., speech-to-text) are two specific types of assistive technology frequently utilized by researchers to support students with disabilities with reading and writing.

Floyd and Judge (2012) and Stodden and Roberts (2005) discussed the implications of using assistive technology to improve reading and writing comprehension performance of college students. Researchers suggested that, for students who lack relevant compensatory strategies on reading and have writing deficits, assistive technology can be beneficial to their academic performance. Floyd and Judge (2012) found that by reading the text aloud via ClassMate Reader (HumanWare Group, 2005–2012), participants could improve reading comprehension scores. Similarly, Stodden and Roberts (2005) suggested that the voice recognition software could assist students in using larger words and matching their vocabulary with writing tasks.

Direct Assistance

Lock and Layton (2008) discussed how direct assistance (e.g., tutoring and remediation) could improve students’ academic success. Direct assistance is a one-to-one instructional strategy that allows students to review and discuss specific course material with a professional (e.g., intervention specialist and instructor) or trained peer tutors (Rath & Royer, 2002). Lock and Layton (2008) investigated the impact of individualized tutoring on students’ GPAs. They modified traditional tutoring, which was only to review coursework with students, to include teaching strategies to remediate skill deficiencies. The results indicated that individualized tutoring was effective in helping students understand and master course content thoroughly and expand their study skill sets (Lock & Layton, 2008). Furthermore, Lock and Layton (2008) found that students who attended tutoring sessions on a regular basis had higher GPAs compared with students who had more absences from their tutoring sessions. In addition to enhanced GPAs, students’ academic accountability and motivation were also improved.

Strategy Instruction

Six studies examined the effectiveness of teaching learning strategies in the areas of writing, reading, testing, and mastery of information (i.e., Butler, Elaschuk, & Poole, 2000; Cooper et al., 2011; Gaddy, Bakken, & Fulk, 2008; Holzer, Madaus, Bray, & Kehle, 2009; Nicholas et al., 2005; Patwa, Chafouleas, & Madaus, 2005). Researchers suggested that students could successfully grasp various learning strategies to improve their academic performance through receiving instructions. Interventions included strategic content learning instruction, paired associates learning strategy, text-structure strategies, test-taking strategy, and structured writing strategy.

Two studies investigated strategies of improving writing performance among college students with LD. Researchers suggested that those writing strategies not only could improve participants’ writing performance but also could promote their cognitive process, such as self-efficacy and self-regulation (Butler et al., 2000; Nicholas et al., 2005). Butler et al. (2000) examined the effectiveness of strategic content learning instruction, where instructors assisted students in brainstorming, composing paragraphs, and reviewing effective strategies. The instructors also highlighted students’ accomplishments in the writing process to promote students’ self-efficacy. The results indicated that after receiving strategic content learning instruction, participants improved their self-efficacy, metacognitive knowledge, and writing skills (Butler et al., 2000). Similar results were also found in Nicholas et al. (2005), in which the researchers explored the use of a researcher-designed structured writing strategy. By employing a structured writing strategy format and rubric for each section, participants completed an expository composition in three writing steps (i.e., brainstorming, formatting, and writing a draft).

Two studies examined the effects of the paired associates strategy on improving the recall and mastery of information (Cooper et al., 2011; Patwa et al., 2005). The paired associates strategy was used to teach students to use the mnemonic keyword method to master and recall information. The findings indicated that participants were able to recall 80% of information correctly and got more correct answers. The results also indicated that the paired associates strategy could increase participants’ learning outcomes when studying a large amount of factual information and could be used as a mnemonic strategy for testing preparation.

Similar to the purpose of the paired associates strategy, Holzer et al. (2009) taught students to use PIRATES mnemonic test-taking strategy to improve their ability on recalling information in the testing environment. PIRATES is a mnemonic device using the first letter of each step. It includes seven steps: Prepare to succeed; Inspect instructions; Read, remember, and reduce; Answer or abandon each question; Turn back when getting to the end of the test; Estimate answers on questions that you did not answer; and Survey the entire test (Holzer et al., 2009). Holzer et al. (2009) used the PIRATES strategy with five students. They found that four participants increased their correction rates on performance prompts and four participants reported reduced levels of anxiety across intervention and maintenance phases. Participants also showed increased task behaviors and had reduced test time.

Gaddy et al. (2008) discussed the application of test-structure strategy in reading science expository-text passages. Students could use this strategy to identify the main idea of a text and understand the important concepts of the main idea (Gaddy et al., 2008). They found that participants who applied the strategy gained higher mean scores and...
remembered more information from the text than those who were in the traditional instruction group.

**Comprehensive Support Program**

Studies identified for the comprehensive support program category consisted of various interventions to promote students’ academic skills and self-determination. In the comprehensive support programs, students can receive group instruction and individual intervention concurrently and are able to choose multiple types of interventions based on their needs. Three studies investigated the effectiveness of these learning support programs, and all of them described a different service delivery model (i.e., Harrison et al., 2012; Reed et al., 2009; Troiano et al., 2010). In these studies, the group or classroom instruction followed a workshop, group meeting, or first-year university success courses format on different topics (e.g., academic strategies, self-advocacy, and self-awareness). The individual interventions included individualized coaching and individual work with a learning specialist. Two primary outcomes of students in these studies were the improvement of academic skills and psychosocial constructs (e.g., self-awareness, self-efficacy, and self-advocacy).

All studies found that students were able to acquire effective learning strategies and earn better GPAs after receiving interventions. In addition, students also made progress in other areas of academic success. For example, students who were in the Learning Opportunities Task Force programs had a lower rate of failure or dropout rate compared with the national average (Harrison et al., 2012). Troiano et al. (2010) also revealed that students who received services from academic support center consistently had higher graduation rates than students who did not. Furthermore, students also had enhanced self-awareness of disability, self-efficacy, and internal locus of control as well as reduced anxiety (Harrison et al., 2012; Reed et al., 2009).

**Discussion**

The purpose of this review was to examine how interventions contribute to academic success of students with LD in postsecondary education. Three major conclusions were drawn from the findings. First, the postsecondary institutions took account of the student-centered approach when designing and implementing interventions. Second, students who received interventions consistently tended to have better academic performance compared with students who did not receive support. Finally, interventions enabled students to generalize skills and knowledge to other academic areas, which led to students’ overall academic improvement.

The majority of interventions we reviewed indicated that the student-centered approach is effective for students with LD to acquire skills to promote their academic success. The student-centered approach emphasizes that students are active agents to acquire learning strategies and able to perform those skills in a wider range of learning tasks without immediate and external assistance (Cooper et al., 2011; Rath & Royer, 2002). When students are active learners, they are not dependent on modifications of course content or one-on-one tutoring or remediation. In this review, we found that researchers focused on fostering students’ independent learning by expanding their academic skills and promoting their personal strengths. Our findings are consistent with those in previous reviews. Rath and Royer (2002) also suggested that maximizing students’ efforts when providing support services is one of the important approaches to promote academic success.

Another important implication of the student-centered approach is that when providing academic interventions, disability services staff applied individualized plan and adjusted training strategies for each student (Butler et al., 2000; Lock & Layton, 2008; Reed et al., 2009; Troiano et al., 2010). Our findings corroborated that individualized interventions can help students overcome their academic difficulties and achieve academic success. Moreover, the outcomes of individualized interventions were more effective than general interventions that solely focused on accommodating learning difficulties.

Findings of this review are also consistent with previous research that demonstrated the persistence is an important key to academic success (Field, Sarver, & Shaw, 2003; Sarver, 2000). Sarver (2000) examined the relationship between self-determination and academic success for postsecondary students with LD. Participants reported that, to finish academic tasks successfully, students with LD should show stronger persistence than their peers without disabilities (Sarver, 2000). Students, who received interventions consistently and frequently, can apply learning strategies to overcoming their academic difficulties, which in turn increase GPAs (Lock & Layton, 2008; Troiano et al., 2010).

The other academic improvement from interventions is that students could enjoy the long-term benefits by applying acquired skills and knowledge to other academic areas. The majority of interventions enabled students to apply acquired strategies independently and generalize the strategies to other courses or academic difficulties (Patwa et al., 2005). Furthermore, many of the participants in these studies could maintain their academic improvements after interventions. Therefore, the academic interventions could produce long-term impacts on students’ academic success and could create alternatives for students to cope with other difficulties resulting from their contextual and functional needs.

Moreover, findings of this study support previous research in that teaching learning and compensation strategies are highly predictive of students’ academic success (Reis, McGuire, & Neu, 2000; Ruban, McCoach, McGuire, & Reis,
Researchers have recognized that successful postsecondary students with LD often possess learning strategies and compensation strategies, such as time management, self-regulated learning strategies, and self-determination.

We also identified a new category of comprehensive support program that has emerged in recent studies. Students were provided with opportunities to meet with intervention or academic specialists one-on-one to receive more individualized support, which is often an improvement from group instructions. For example, Troiano et al. (2010) used an individualized support plan to determine the extent of individual support for each student. Besides, students’ progress could be monitored throughout the program and individual intervention could be adjusted according to students’ needs (Harrison et al., 2012; Troiano et al., 2010). It is noteworthy that there are studies with large sample sizes (i.e., a mean of 419) in this category too. The findings of reviewed articles indicated that comprehensive support program is a promising intervention to promote students’ academic success.

Limitations and Future Research

This study has several limitations. First, the generalizability of the findings to broader populations of students may be limited because the majority of studies had small sample sizes. Furthermore, due to the small number of identified studies on the topic and variations in research methodologies, it is difficult to evaluate the quality of research. Thus, the effectiveness of each intervention or support services should be interpreted with caution. There is a lack of empirical studies on the topic. Third, within our search terms, and inclusion and exclusion criteria in the literature search, it is possible that pertinent studies were missed. For example, in our literature search, we did not find studies from the counseling and therapy field. Fourth, because we focused on students with LD and excluded studies that examined wide ranges of disabilities, some interventions that could support students with LD may not have been found in this study.

In addition to the above limitations, we also have two more recommendations for future research. First, more research on self-determination instruction is needed to support students with LD in postsecondary education. The findings of this review showed that self-determination (e.g., self-efficacy, self-advocacy, self-awareness) could be improved through training which also impacted academic success (Harrison et al., 2012; Reed et al., 2009). Meanwhile, we found that students who demonstrated persistence demonstrated more academic success in the interventions. Although research has recognized that self-determination could improve the likelihood of academic success for students (Konrad, Fowler, Walker, Test, & Wood, 2007; Zheng, Erickson, Kingston, & Noonan, 2014), our review indicates there is a lack of studies focusing on self-determination instruction for students in postsecondary education. Thus, more efforts should be made to examine how self-determination instruction can influence academic success for students with LD.

Second, because many requirements under IDEIA of 2004 and Section 504 do not apply to postsecondary education, how to provide individualized interventions to students in postsecondary education becomes a burning question for the future research. One issue raised by our reviewed articles is that individualized interventions are often costly in postsecondary education and funding is not always available for this type of services (Lock & Layton, 2008). Thus, future researchers should investigate how individualized support and interventions can be integrated into existing disability services or elective courses.

Implications for Practice

The results of this review indicate that the current LD interventions follow the student-centered approach and individualized intervention is one of the methods to deliver learning support in postsecondary education. Moreover, when students demonstrate persistence and intent to generalize acquired strategies, they are more likely to achieve academic success. These results speak to a number of implications for academic interventions in postsecondary education, particularly for disability services practitioners and educators.

First, in addition to offering accommodations and direct assistance (e.g., content-based tutoring), disability services providers should also include instructions on functional skills (e.g., problem-solving, organizational skills) in their services. For example, disability services staff might consider a series of workshops or online learning modules that introduce learning strategies and knowledge on learning deficiencies. They may also consider using peer support and identify academic and social peer mentors for students with LD. Second, it is imperative for secondary and postsecondary educators to promote students’ self-advocacy so that students will take more initiative in seeking interventions and support. For example, postsecondary institutions could adopt the model of Youth Leadership Forum (Grenwelge, Zhang, & Landmark, 2010), in which students gain opportunities to learn leadership and self-advocacy skills. Meanwhile, curricula on self-determination, such as the Self-Determined Learning Model for Instruction (Wehmeyer, Palmer, Agran, Mithaug, & Martin, 2000), can be considered as a resource for students to learn goal-setting, self-advocacy, self-regulation, and self-monitoring skills in group or individual interventions.

Third, based on the unique needs of each student, disability services staff and intervention specialists are likely to need to devote more time and resource to customize individualized interventions. These changes would bring higher workloads and require more professional knowledge on specific disabilities. To deliver effective and appropriate
interventions, services providers should receive further professional training and receive adequate funding to pay for these training and possible increases in the amount of staff they will need to employ. For example, postsecondary disability services personnel could consider webinars on relevant topics provided by professional organizations as professional development.

Lastly, given that only 12 studies have been identified on this topic over the past 16 years, it is obvious there is a great need for raising the attention to the matter. More resources and research will be needed to identify academic interventions for students with LD in postsecondary education. It is critical for postsecondary disability personnel to advocate for more funding and resources to support such efforts.

Conclusion
This review provides an update on extant interventions on academic success of college students with LD. We argue that the student-centered approach and individualized interventions are valuable in postsecondary education. The majority of reviewed studies implied that the student-centered approach could be used to develop students’ skills and personal strengths so that they can enhance independence and generalize skills following interventions. It is also important to recognize that one-size-fits-all interventions often do not adequately meet students’ needs, and individualized intervention could serve as a better approach to assist students in dealing with rigorous academic demands. The results also demonstrate that these interventions are effective for helping students achieve academic success and can bring long-term benefits to students.

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Articles included in the review are marked with an asterisk.


