Identifying College Students At Risk for Learning Disabilities: Evidence for Use of the Learning Difficulties Assessment in Postsecondary Settings

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Abstract

This article describes research supporting the use of the Learning Difficulties Assessment (LDA), a normed and no-cost, web-based survey that assesses difficulties with reading, writing, spelling, mathematics, listening, concentration, memory, organizational skills, sense of control, and anxiety in college students. Previous research has supported the instrument's item and factor structure, reliability, and predictive validity for identifying college students at risk for learning disabilities. In the current study, data from a large scale study (n = 775) demonstrate further psychometric evidence for the instrument's utility as a screening and referral tool for college students at risk for learning disabilities. Recommendations for use of the LDA by postsecondary disability support professionals are discussed as well as limitations of the study and implications for future research.

Keywords: College students, learning difficulties, learning disabilities, LD, academic at-riskness

The National Center for Education Statistics ([NCES], 2010) estimates that only about 57 percent of first-time students at four-year institutions nationwide complete a bachelor's degree or its equivalent at their original institution within six years. Graduation data for two-year community colleges are more dire, with less than 25% nationwide completing their two-year degrees within three years (Schneider & Lin, 2012; NCES, 2010). Given these findings, it is not surprising that research also indicates that at least a quarter of all university students and nearly three-fifths of community college students nationwide are academically underprepared and must complete some form of remedial coursework, often significantly delaying their academic progress (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2007; Engle, Bermeo & O'Brien, 2006). At the same time, many college students and their families are facing enormous financial challenges and are under great pressure to complete their college studies in a timely manner. Perhaps most troubling, college students who drop out before completing their degrees often have the earning power of only a high school graduate (Schneider & Lin, 2012; Barton, 2002).

In addition to the above scenario, students with learning disabilities (LD) and Attention Deficit Hyperactivity Disorders (ADHD) are attending colleges and universities in growing numbers while funding for disability support services has been reduced on many campuses. In fact, as many as 4% of college students nationwide have an LD, while an estimated 1-4% of American college students have ADHD (American Psychiatric Association, 2000; Faraone, Sergeant, Gillberg and Biederman, 2003; Shifrin, Proctor and Prevatt, 2009). Moreover, a recent study found that approximately 2% to 8% of a college population reported clinically significant levels of ADHD symptomatology, and at least 25% of college students with disabilities were diagnosed with ADHD (DuPaul, Weyandt, O'Dell, & Varejao, 2009).

Having poor academic and cognitive skills has been identified as one of the leading predictors of early departure from college (Wilens, Faraone, & Biederman, 2004; Tinto, 1993; Tobey, 1997) and having a learning disability in particular is a primary risk factor for a lifetime of underemployment and lower wages (Thoma, Lakin, Carlson, Austin, & Boyd, 2011). Given these findings, there is a critical need for college-level screening and "early-alert" instruments that can help higher education professionals -- and disability support staff in particular -- quickly and accurately identify college students at risk for learning disabilities and related academic challenges. In an era of continuing budget cuts to disability support programs, there is an especially urgent need for a no-cost, reliable, and valid screening tool that can help disability support professionals determine who should be referred for the type of diagnostic assessment that can clarify students' learning needs and potentially qualify them for accommodations.

Relatively little research has been conducted on developing no-cost, psychometrically robust screening tools for identifying college students at risk for learning disabilities. This is surprising given the significant financial costs and emotional toll of dropping out of college. Most research efforts have focused on the assessment of learning styles in college students and the identification of children at risk for learning disorders, especially given recent federal legislation promoting early identification of at-risk children (Kettler, 2006). Though instruments such as the Scholastic Abilities Test for Adults (Bryant, Patton, & Dunn, 1991) and the Dyslexia Adult Screening Test (Fawcett & Nicolson, 1997) have been developed to screen for learning disabilities, assessments such as these are often expensive and must be individually administered. Being able to quickly screen college students at risk for learning disabilities is imperative as one study found that 31% of participants with specific learning disabilities indicated that their disability was first identified at the postsecondary level (National Center for the Study of Postsecondary Educational Supports [NCSPES], 2002). Another study found that when declaring a primary disability, 44% of the participants with an attention deficit/hyperactivity disorder (ADHD) indicated that their disability was first identified at the postsecondary level (National Council on Disability, 2003).

In this article, we present further data supporting the use of the Learning Difficulties Assessment (LDA), a normed and no-cost internet-based assessment that assesses difficulties with reading, writing, spelling, mathematics, listening, concentration, memory, organizational skills, sense of control, and anxiety in college students (Schmidt & Kane, 2009). Interested readers can take the LDA anonymously and at no charge (www.ldacv.com). Researchers can examine psychometric components (e.g., item and factor structure, scoring grid methodology) of the LDA via the American Psychological Association's PsychTESTS database (Kane, 2011). Empirical support for its reliability and validity are presented below along with implications for its use by postsecondary disability support professionals.

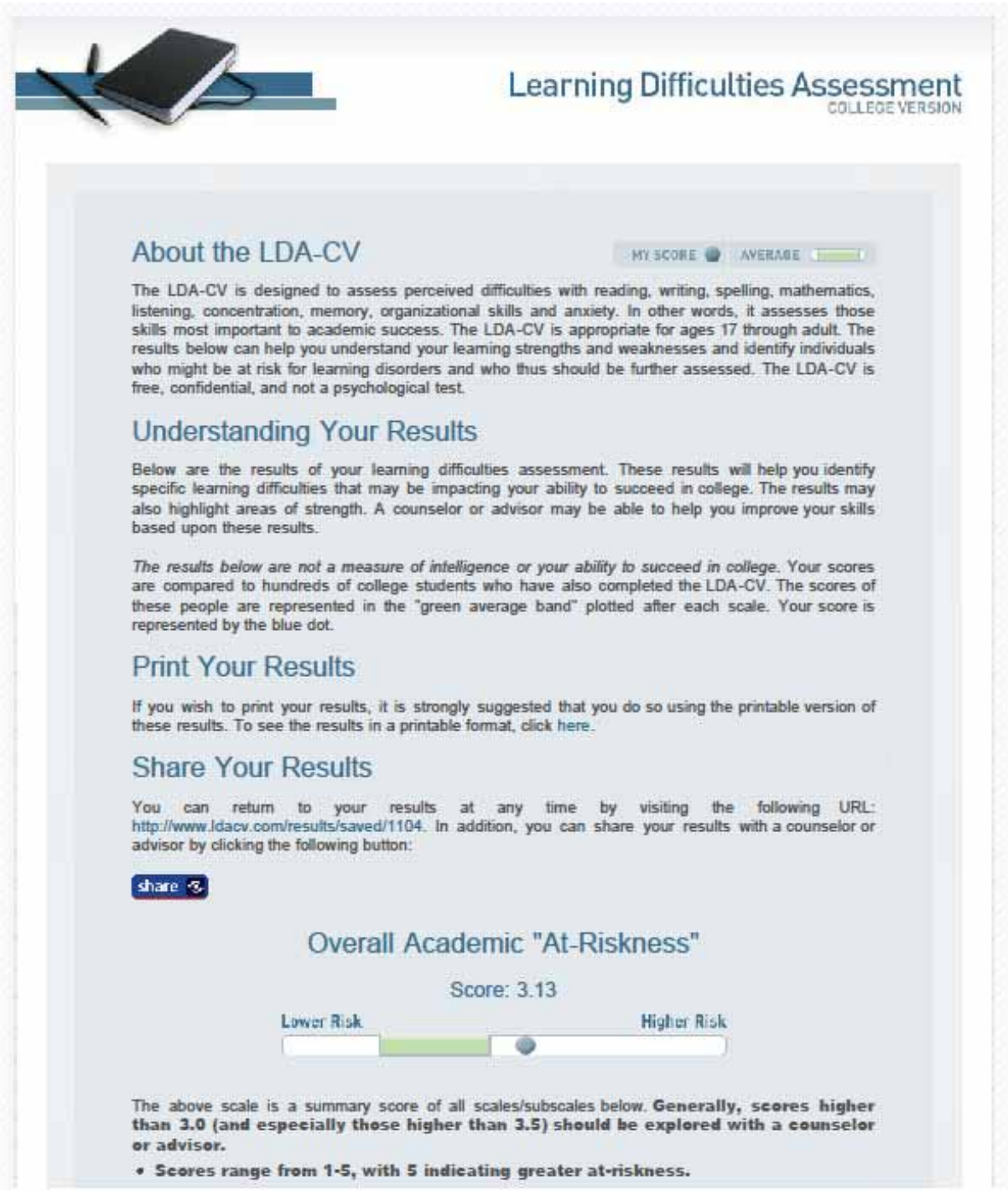
Development and Validation of the Learning Difficulties Assessment

Our goals when designing the LDA were fourfold. We wanted to create a no-cost, web-based assessment tool that could (1) map individual learning strengths and weaknesses, (2) provide users with a comparative sense of their academic skills, (3) integrate research in user-interface design to assist those with reading and learning challenges, and (4) identify individuals who may be at risk for learning disabilities and who should thus be referred for further assessment. Since the LDA was designed to be relatively simple to interpret, end users may be students, disability professionals, instructors, or evaluators. Easy-to-read, graphically driven instructions are included in the no-cost interpretive report. See Figure 1 for a sample page of the printout.

After extensive consultation with learning disability specialists, psychologists, academic advisors, and counselors, development of the LDA began over ten years ago from an initial pool of over 200 items. After multiple studies using confirmatory factor analysis, the LDA now has 123 items contributing to 23 scales and subscales. Table 1 lists the primary scales and subscales, along with item/scale inter-correlations and the number of items included in each scale. The final 123 items were derived both logically and empirically and a single item may contribute to several scales.

The LDA also offers the user an "overall academic at-riskness" score (hereafter referred to as the LDA "profile score") that correlates with their likelihood of having a learning disability or attention deficit disorder. Previous research has found that respondents scoring higher than 3.5 on the LDA profile score are statistically more likely to have a LD or ADHD and, if possible, should be further assessed by a qualified evaluator (Kane, Walker, & Schmidt, 2011). Thus, the

Figure 1. Sample Learning Difficulties Assessment Interpretive Printout.



Learning Difficulties Assessment
COLLEGE VERSION

About the LDA-CV

MY SCORE AVERAGE

The LDA-CV is designed to assess perceived difficulties with reading, writing, spelling, mathematics, listening, concentration, memory, organizational skills and anxiety. In other words, it assesses those skills most important to academic success. The LDA-CV is appropriate for ages 17 through adult. The results below can help you understand your learning strengths and weaknesses and identify individuals who might be at risk for learning disorders and who thus should be further assessed. The LDA-CV is free, confidential, and not a psychological test.

Understanding Your Results

Below are the results of your learning difficulties assessment. These results will help you identify specific learning difficulties that may be impacting your ability to succeed in college. The results may also highlight areas of strength. A counselor or advisor may be able to help you improve your skills based upon these results.

The results below are not a measure of intelligence or your ability to succeed in college. Your scores are compared to hundreds of college students who have also completed the LDA-CV. The scores of these people are represented in the "green average band" plotted after each scale. Your score is represented by the blue dot.

Print Your Results

If you wish to print your results, it is strongly suggested that you do so using the printable version of these results. To see the results in a printable format, click here.

Share Your Results

You can return to your results at any time by visiting the following URL: http://www.ldacv.com/results/saved/1104. In addition, you can share your results with a counselor or advisor by clicking the following button:

share

Overall Academic "At-Riskness"

Score: 3.13

Lower Risk — Higher Risk

The above scale is a summary score of all scales/subscales below. **Generally, scores higher than 3.0 (and especially those higher than 3.5) should be explored with a counselor or advisor.**

- **Scores range from 1-5, with 5 indicating greater at-riskness.**

Table 1

Learning Difficulties Assessment Scales, Subscales, No. of Items & Item/Scale Inter-correlations

Scale / Subscale	No. of Items	Item / Scale Inter-correlation
General Reading Scale	23	.94
Reading-Physiological Aspects	5	.76
Reading-Processing and Comprehension	10	.89
General Listening Scale	16	.90
Listening-Memory and Concentration	8	.87
Listening-Information Processing	11	.85
General Concentration / Memory Scale	11	.90
General Writing Scale	18	.91
Processing	14	.86
Spelling	3	.89
Note Taking	8	.83
Copying	4	.75
General Math Scale	16	.89
Processing	8	.87
Symbolic understanding	6	.72
General Time Scale	18	.87
In-class & testing	5	.76
Procrastination	3	.81
Organization and Control Scale	18	.86
Organization	4	.71
Task Focus	6	.74
Anxiety / Pressure Scale	8	.78
Oral Presentation Scale	6	.72

Note: Number of items totals more than 123 because a single item may contribute to one or more subscales.

LDA may be useful in a variety of higher education settings for professionals seeking to identify academically at-risk college students. For a detailed history of the psychometric development of the LDA, please see Kane, Walker, and Schmidt (2011).

The LDA was programmed on a PHP/SQL platform and contains an automated demographic/research database. In designing the LDA, we followed many of the suggestions for effective web page design offered by Fowler and Stanwick (2004). Given that one of our goals was to use the LDA as a screening tool for learning disabilities, the reading level of LDA items was set at approximately the 6th grade level. Participants rate each item (e.g. "I don't retain much of what I read") on a 5-point Likert scale ranging from 5, "Agree Completely" to 1, "Disagree Completely." Summative LDA profile scores range from 1-5, with 5 indicating severe academic problems.

The LDA's on-screen field was designed to be visually appealing and clutter-free and items are presented to the user one at a time and in large fonts (see Figure 2). LDA questions advance automatically to reduce user fatigue and testing time, and can be completed in less than 15 minutes by most users. Though demographic data is collected from each respondent, no personal or identifying information is requested. Upon completion of the assessment, a no-cost four-page interpretive profile of the assessment can be printed immediately. In addition, a copy of the profile can be emailed to an advisor, teacher, or counselor. Perhaps most importantly, respondent scores are graphed relative to the norming population so that users have a comparative sense of their academic strengths and weaknesses.

Previous research has demonstrated item/scale inter-correlations ranging from .71 to .94 (Table 1). A Cronbach split-half reliability coefficient of .91 was obtained from a sample of 183 university students. A thirty-day test-retest reliability coefficient of .87 was obtained from a sample of 36 university students (Kane, et al., 2011).

The LDA has also demonstrated strong construct validity related to the assessment of learning strengths and weaknesses. For example, high profile scores on the LDA (indicating significant academic difficulties) were found to be significantly correlated with lower levels of academic self-efficacy for college-level learning (Kane, 2008). In a large scale five-year test of the LDA's predictive validity, a logistic regression analysis and Receiver Operating Characteristics analysis provided support for the instrument's ability to detect college students at risk for learning and attention deficit disorders (Kane, et al., 2011). The current version of the LDA was normed on an ethnically and socioeconomically diverse population drawn from over 1200 respondents from the western United States.

The Present Study

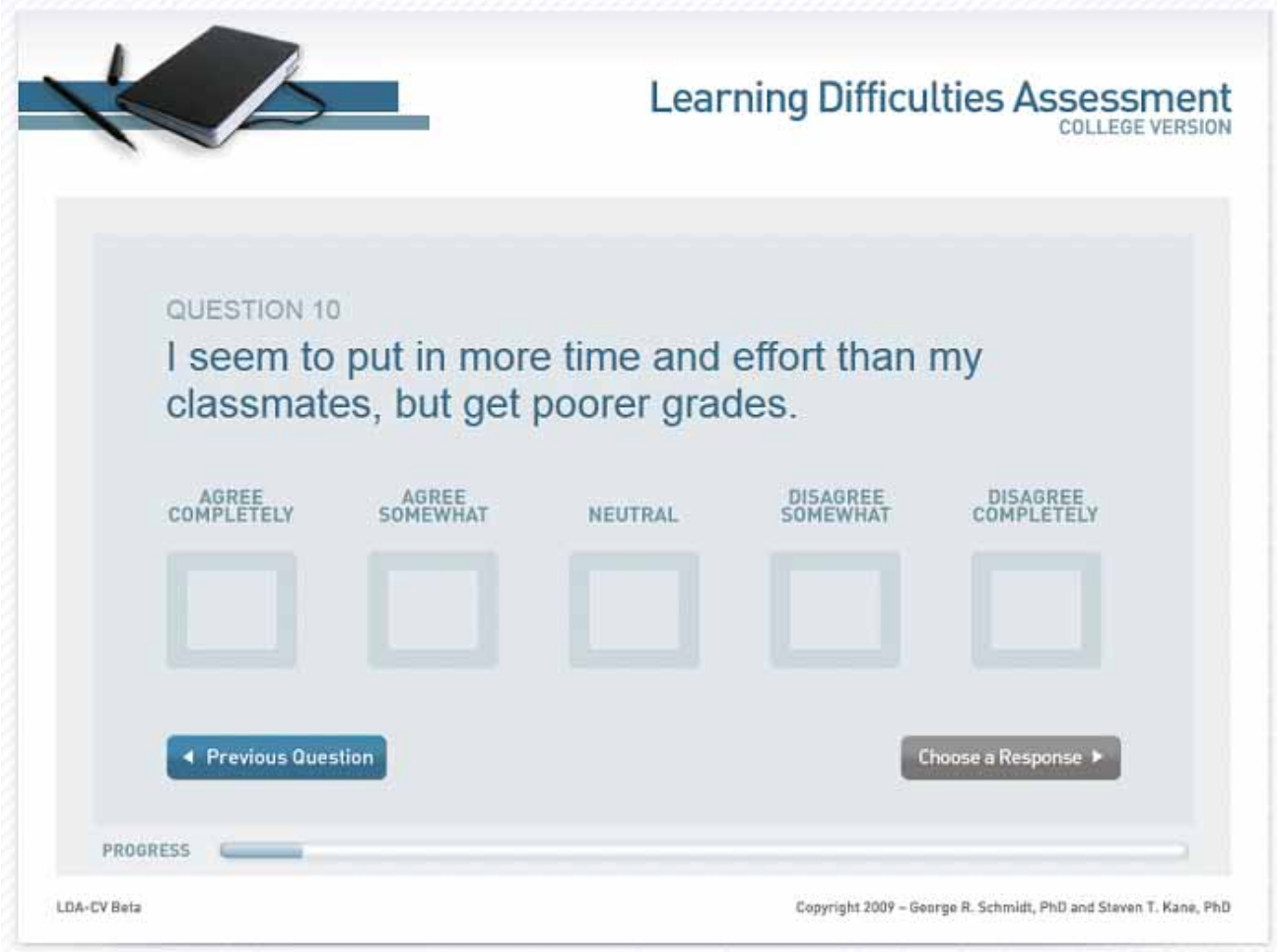
Given previous research supporting the LDA's reliability, validity, and factor structure, we wanted to explore the performance of the LDA relative to variables such as age, gender, and ethnicity on a large scale. We also wanted to examine more closely whether LDA scores are related to high school and college GPA, as well as whether LDA scores can predict the odds of a respondent having a learning disability. Thus, the research questions driving this study are: (a) Are there significant demographic differences in LDA profile scores? (b) Is the LDA profile score associated with high school GPA and college GPA? (c) Is the LDA profile score predictive of self-perceived "ability to succeed in college"? (d) Do LDA profile scores predict who might be diagnosed with a LD? And finally, (e) Are LDA profile scores predictive of severity of self-reported LD?

Method

Participants and Procedures

Data were collected anonymously from 775 participants who responded to the internet-based LDA from June 2011 to May 2012. Though anonymous, extensive demographic data was voluntarily collected from each participant as well as the self-reported data described below under "Measures." Google Analytics indicated that participants were primarily from California, Oregon, and Washington, but data were also collected from individuals in the Midwest and East Coast of the United States. Though some respondents were from as far away as Europe and the Middle East, these data were not included in present study. Data were collected regarding age, gender, race/ethnicity, current academic situation, highest level of education obtained, high school, and college GPA (see Table 2). Though some respondents may have discovered the LDA while searching the internet, many were referred to the LDA assessment by a counselor, academic advisor, and/or classroom instructor.

Figure 2. Sample Learning Difficulties Assessment Respondent Screen View and Question.



Measures

To facilitate data analyses and test for the research questions described above, we collected data regarding the respondents' perceptions of their ability to succeed in college (academic self-efficacy), whether or not they have been diagnosed with (or suspect having) a learning disability, and if so, the perceived severity of their learning challenges. These data are summarized in Table 3.

To assess perceptions of their ability to succeed in college environments, each respondent was asked the following question: "Based upon what I know about my skills and abilities, I would rate my overall ability to succeed academically as…" Possible responses ranged from "Much higher than my peers" to "Much lower than my peers."

Individuals indicating a previous diagnosis of a learning disability were asked to rate the severity of their learning disorder on the following scale:

1. Very minor and does not affect college performance
2. A disruption that requires extra effort in some classes but does not affect my overall performance
3. A significant disruption that requires great effort to get the grades I want
4. A significant disruption that causes me to get lower grades than I am capable of
5. A significant disruption that may force me to drop out of school
6. A significant disruption that has already forced me to drop out of school

To reduce possible sampling error and increase the robustness of the data, only individuals who indicated scores higher than 3 on the above scale were included

Table 2

Respondent Demographics (n = 775)

Variable	Category Level	%
Gender	No response	3.61
	Female	51.42
	Male	34.97
Age (years)	No response	2.58
	16 or younger	1.29
	17-22	49.68
	23-28	17.42
	29-35	7.35
	36-49	9.55
	49 or older	12.13
Primary Ethnic Identification	No response	4.52
	Asian	8.77
	American Indian	0.52
	African American/Black	3.74
	Hispanic/Latino	8.90
	Pacific Islander	0.26
	European American/White	63.23
	Mixed heritage	10.06
Highest Level of Education	Less than high school, no response	6.96
	High school	28.39
	Some college	36.26
	College	10.97
	Graduate studies	17.42
High School GPA	No response	10.06
	1.00-1.50	0.39
	1.51-2.00	2.84
	2.01-2.50	8.52
	2.51- 3.00	14.97
	3.01-3.50	24.90
	3.51-4.00	29.68
	Greater than 4.00	8.65
College GPA (if applicable)	No response	23.23
	1.00-1.50	1.29
	1.51-2.00	5.29
	2.01-2.50	16.00
	2.51- 3.00	18.45
	3.01-3.50	18.84
	3.51-4.00	16.26
	Greater than 4.00	0.65
Current Situation	No response = 0	11.10
	Vocational school/technical college	1.42
	Community college	9.03
	Four-year college or university	51.61
	Graduate student	10.32
	Not enrolled	10.45
	Other	6.06

in the data analysis as having significant academic impairment. This is important given the self-report nature of the data. Previous research with the LDA in a highly controlled diagnostic environment using scales similar to those above found that college students were often accurate self-reporters of their LD and/or ADHD symptoms that in fact predicted a subsequent diagnosis of LD or ADHD (Kane et al., 2011).

Results

Separate one-way Analysis of Variance (ANOVA) models were run on Minitab 16 (Minitab 16, 2010) using LDA profile score as the dependent variable, and various explanatory variables reflecting our research questions as described above. As reflected in Table 4, the difference between males and females with regard to average LDA profile scores was found to be insignificant ($p = 0.095$); similarly, differences between race/ethnicity were also found to be insignificant ($p = 0.065$). In contrast, the data revealed a significant relationship between age group and LDA profile score ($p < 0.001$), with individuals 49 years or older scoring significantly lower on the LDA than those 35 years or younger. Please note that this implies that respondents 35 years or younger tended to have greater academic difficulties (i.e., higher LDA profile scores).

We also found evidence of a significant association between LDA profile scores and highest level of education ($p < 0.001$), high school GPA ($p = 0.006$), and college GPA ($p < 0.001$), if applicable (Table 4). More specifically, individuals who had completed graduate studies tended to score significantly lower on the LDA, on average, compared to those with only some college or less. Also, those with a college GPA higher than 4.0 were found to have significantly lower LDA profile scores, on average, compared to a college GPA of 3.0 or lower. Having a college GPA somewhere between 3.01 and 4.0 was, quite understandably, not found to be significantly different from having a college GPA higher than 4.0. Individuals with high school GPA higher than 4.0 were found to have significantly lower LDA profile scores, on average, compared to those with a high school GPA between 3.01 and 4.

Logistic regression was used to investigate LDA profile score as a predictor of (a) attitude toward one's ability to be academically successful, (b) the odds of being diagnosed with a learning disability (LD), and (c) self-reported severity of LD. We used Minitab 16 for running three separate logistic regression models, each with LDA profile score as the predictor (Table 5). We found very strong evidence of an association between LDA profile score and attitude towards academic success ($p < 0.001$); all else remaining equal, individuals with higher LDA profile scores are more likely to feel that their overall ability to succeed academically is lower than their peers, compared to those with lower LDA profile scores. Also, those with higher LDA profile scores were found to be significantly more likely to be diagnosed with a LD ($p < 0.001$), and significantly more likely to report the severity of their LD as "significant" rather than minor ($p < 0.001$).

Table 5 also gives the estimated odds ratios (OR), and the 95% confidence intervals for the corresponding OR. Logistic regression procedures and OR analyses are considered the most appropriate and effective methodologies for the analyses of categorical dependent variables such as those presented here (Agresti, 2007). The estimated OR for being diagnosed with LD was calculated to be 2.61, with the 95% confidence interval being 2.08, 3.27. Note that an OR of 1 would indicate that LDA profile score is not associated with being diagnosed with LD. Thus, we are 95% confident that all else being equal, an increase of one point in the LDA profile score increases the odds of being diagnosed with a LD by between 108% to 227%. The other OR can be interpreted similarly. The p-values for the Hosmer-Lemeshow goodness-of-fit tests can also be found in Table 5, and provide no evidence against model adequacy. In sum, the data provide significant evidence that LDA profile scores can be used as a predictor of attitude towards being academically successful ("academic self-efficacy"), being diagnosed with a LD, and self-evaluation of the severity of LD.

Discussion

The data presented above provide further evidence for use of the LDA as a screening tool to identify college students at risk for learning disabilities. Previous research has supported the item and factor structure of the LDA, as well as its reliability and predictive validity. The current study provides additional evidence for the LDA's validity and its use with relatively diverse college populations. For example, there were no significant ethnic or gender differences found on LDA profile scores. In the present study, higher LDA profile scores were found to be predictive of self-perceived "ability

Table 3

Descriptive Statistics for Perceptions of Learning Ability and Learning Disability Status (n = 775)

Variable	Levels	%
Ability to succeed academically?	No response	3.35
	Lower than my peers	66.58
	Same or higher than my peers	30.07
Diagnosed with a learning disability?	No response	3.35
	Yes	47.61
	No	49.03
Self-reported severity of learning disability?	No response	53.03
	Significant	33.29
	Minor	13.67

to succeed in college" and were associated with high school and college GPA. Perhaps most importantly, high LDA profile scores were found to be predictive of having a learning disability and, if so, its severity. The authors of this study know of no other psychometrically robust and no-cost instrument that can identify college students at risk for learning disabilities.

Given that poor academic and cognitive skills are some of the leading predictors of early departure from college, identifying college students at risk for learning disabilities should be a priority. As noted above, a surprisingly large number of individuals are first diagnosed with LD or ADHD during their college years. Disability support professionals are in a unique position to identify academically at-risk college students *early* in their academic careers and connect these individuals with the resources necessary to support their success. Moreover, the LDA may be especially helpful to disability specialists to help determine *when* a student should be referred for diagnostic assessment for a possible learning or attentional disorder. For example, students with LDA profile scores higher than 3.5 are significantly more likely to have a LD or ADHD and should be referred for further diagnostic counseling, screening, and assessment. Used in concert with other data (grade point average, academic history, family history of LD, developmental history, etc.), the LDA may be also helpful to disability support professionals in determining *which* students are most at risk and who thus should be assessed first, given the often limited financial resources on most college campuses.

The LDA can also be helpful to disability support counselors who teach academic skills courses in that it essentially provides a remediation "map" indicating where a student most needs assistance and skill building to succeed. For example, individualized tutoring could be focused on those areas of greatest risk as indicated by the LDA. The LDA is already being used by several community colleges and universities in this manner.

The results of the current study also suggest that the LDA may be helpful for a variety of other higher education professionals, including counselors and academic advisors, and of course, faculty. In fact, many two- and four-year instructors are currently using the LDA to better understand the needs of their students and to identify at-risk individuals *before* they fail. Faculty can request that the LDA be completed as a course assignment and counselors/advisors can request that students complete the LDA as part of their orientation and/or advising process. Some universities have linked the LDA website to their counseling center's website, as many students suspecting a LD or ADHD often first seek help from these departments.

There are several limitations of this study that should be noted. First, while the sample size of this study is large, the sample was not randomly selected and hence might not be fully representative of the

Table 4

LDA Profile Score in Relation to Demographic Variables

Variable	Category / Levels	LDA Profile Score (SD)	*p*-value
Overall (N = 775)	Mean LDA profile score of all respondents	3.04 (0.74)	n/a
Gender (n=747)	Female	3.08 (0.75)	0.095
	Male	2.98 (0.73)	
Age* (years) (n = 755)	22 or younger	3.10 (0.68)[a]	< 0.001
	23-28	3.07 (0.73)[a]	
	29-35	3.14 (0.76)[a]	
	36-49	2.95 (0.81)[a, b]	
	49 or older	2.71 (0.86)[b]	
Ethnicity* (n = 740)	Asian	3.13 (0.76)	0.065
	African American/Black	3.12 (0.77)	
	Hispanic/Latino	3.13 (0.76)	
	European American/White	2.98 (0.73)	
	Mixed heritage (includes American Indian & Pacific Islander)	3.19 (0.74)	
Highest Education Completed (n = 747)	Less than high school, no response	3.23 (0.82)[a]	< 0.001
	High school	3.19 (0.66)[a]	
	Some college	3.09 (0.67)[a, b]	
	College	2.87 (0.81)[b, c]	
	Graduate studies	2.70 (0.82)[c]	
High School GPA* (n = 697)	2.00 or less	3.22 (0.83)[a, b]	0.006
	2.01-3.00	3.05 (0.82)[a, b]	
	3.01-4.00	3.22 (0.74)[a]	
	Greater than 4.00	2.97 (0.71)[b]	
College GPA* (n = 595)	2.00 or less	3.21 (0.70)[a]	0.001
	2.01- 3.00	3.07 (0.63)[a]	
	3.01-4.00	3.10 (0.69)[a, b]	
	Greater than 4.00	2.87 (0.79)[b]	

Note: LDA profile scores range from 1-5; 5 = highest level of academic impairment. Means that do not share a letter are statistically significantly different, at the .05 level of significance.
*Two or more categories may have been combined to account for small sample sizes in certain categories.

Table 5

LDA Profile Score as a Predictor of (a) Attitude Toward Ability to Succeed Academically, (b) Being Diagnosed with a Learning Disability, and (c) Self-reported Severity of Learning Disability

	Pessimistic about ability to succeed academically (n = 749)	Diagnosed with learning disability? (n=749)	Self-reported severity of learning disability? (n=364)
p-value	< 0.001	< 0.001	< 0.001
Odds Ratio	3.82	2.61	3.62
95% CI for OR	(2. 90, 5.03)	(2.08, 3.27)	(2.40, 5.45)
Hosmer-Lemeshow goodness-of-fit *p*-values	0.46	0.09	0.49

general college student population of the United States. However, the results can be safely generalized to people similar in age, race/ethnicity, educational background, etc., as those in the study. Second, there is no cause-and-effect inference to be made from this study. The data were collected through an observational study, and we can infer only association between the variables of interest. The reader should exercise some caution in interpreting the results because the data were self-reported and collected anonymously via the internet. However, as noted earlier, similar data collected from a large-scale, highly controlled study testing the reliability and predictive validity of the LDA also found significant support for its use.

Research is already underway investigating which particular LDA sub-scales best predict ability to succeed in college, whether or not they have a LD, and if so, the severity of the LD. Future research will also focus on how the LDA might predict academic "at-riskness" in underrepresented student populations and in high school seniors transitioning into their first year of postsecondary education. Given the high financial and emotional toll of dropping out of college due to an undiagnosed LD, there is a critical need for widespread use of "early-alert" and screening instruments like the LDA.

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