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Dyscalculia, Assessment, and Student Career Efficacy: Implications for College Counselors

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Introduction

More than 130,000 students with learning disabilities attend college in the United States and the numbers continue to increase (Matthews, Anderson, & Skolnick, 1987). The issue of academic assessment is of critical importance to the preparation of students with [learning] disabilities (Omizo & Omizo, 1992), and this is especially true when the learning disability is a math disorder which inhibits the critical skills necessary for a thorough examination of career interests, values, abilities, and maturity in learning disabled individuals. Understanding what constitutes a math disorder is of critical importance to professionals who are responsible for the assessment and identification of mathematical disabilities and who seek to develop and validate effective assessment techniques and instruments. College counselors are in an especially valuable position to help students with disabilities achieve academic and vocational success by understanding the academic barriers unique to this population.

Dyscalculia

It is well documented that students with math LD leave high school with demonstrably lower levels of mathematics achievement than their peer group (Wagner, 1990, as cited in Bryant, Bryant, & Hammill, 2000). However, there is a paucity of research on arithmetic functions and their disorders compared to available data on reading, dyslexia, and alexia (Neumarker, 2000).

The DSM-IV-TR (2000) defines the criteria of 315.1 Mathematics Disorder as: Mathematics ability, as measured by individual administered standardized tests, is substantially below that expected given the person’s chronological age, measured intelligence, and age-appropriate education.

Also known as Dyscalculia and developmental arithmetic disorder, Mathematics Disorder is a learning disability similar to dyslexia, or difficulty with reading. Among those with dyscalculia, some can develop math phobia, or a fear of math, because of bad experiences with math or in math class, or simply because of poor self-confidence in the subject (Toppo, 2003).

Assessment Techniques
According to the DSM-IV-TR (2000), any individual which meets this criteria may have deficits in linguistic, attention, and perceptual skills, and in some cases, all three areas may be impaired. A number of various standardizes tests may be used to diagnose the disorder, including the following: The Wechsler Adult Intelligence Scale-Revised (WAIS-R), the Woodcock-Johnson-Revised Tests of Achievement, the Wide Range Achievement Test-Revised (WRAT-R), the Peabody Picture Vocabulary Test-Revised (PPVT-R), the Wechsler Individualized Achievement Test (WIAT), and the Wonderlic Personnel Test. In fact, the Wonderlic Personnel Test (WPT) is perhaps the most widely used instrument to assess intellectual ability in career and occupationally-related counseling and assessment settings (Leverett, Matthews, Darin, Bell, & Bell, 2001).

In considering IQ scores in relation to learning disabilities and assessment, it is important to note that intelligence exists as just one of the many issues pertinent to occupational choice, and may not be as important as motivation, discipline, or other personality variables (i.e. ability to work and communicate with others, attitudes toward work, etc.) (Leverett, Matthews, Darin, Bell, & Bell, 2001). IQ measures an individual’s existing knowledge and does not address future capabilities. Further, it must be taken into consideration that there is often overlap between achievement and IQ measures, and an individual’s learning disability could certainly affect the assessment of their overall cognitive potential.

This is particularly true in the case of those who have a diagnosis of Dyscalculia, as the inability to conceptualize problems in a mathematical manner does not reflect an overall intelligence level, but instead may point to a discrepancy in learning style, ability to think in structured mathematical terminology, or the lack of exposure to techniques in mathematical computation utilizing various strategies.

**ACT Scores**

Other assessment measures include ACT and SAT scores. These are often considered in context to the students’ overall ability over time, and in conjunction with other measures of assessment. In a study by Vogel and Adelman (1992) found that students with learning disabilities scored significantly lower than nondisabled students in ACT scores and ACT subtests. This may indicate that learning disabled students differ in achievement areas and levels, and these scores may also be somewhat indicative of ability or potential for those students that have isolated learning disabilities, such as Math Disorder.

However, it is important to consider that other factors, including age, overall comprehensive linguistic ability, and intensive training may improve a students’ ability to compute complex mathematical problems while still under the umbrella of an LD, regardless of ACT or SAT score. Vogel and Adelman (1992) suggest that ACT information be supplemented by a careful analysis of the high school transcript and other relevant information, such as recent results from the Wechsler Adult Intelligence Scales-Revised (WAIS-R), academic achievement levels, previous psychoeducational reports,
case history information, letters of recommendation, and interviews.

Impact on Career Efficacy

Increasing numbers of persons with learning disabilities who are now entering college have been found to have special needs related to both academic success and career development that are often unrecognized in postsecondary education contexts (Levinson & Ohler, 1998). These special needs greatly impact their chances for vocational success since persons with learning disabilities have been found to be passive learners who then might not engage in exploratory activities such as part time jobs or extracurricular activities (Alley et al., 1983). Knowing this, these individuals may be less likely to engage in vocational pursuits or vocational-based extracurricular activities, to explore career interests, or put forth effort toward finding appropriate employment after graduation.

Further, they may enroll in “easy” courses, without meeting the appropriate challenges that would steer them toward gainful employment later on, which greatly impacts their career maturity at any stage of development. Vogel & Adelman (1992) found that students with learning disabilities took almost one year longer to complete their undergraduate degree than students without learning disabilities. This may either be due to the challenge of the curricula, a lack of resources, or the belief that they cannot succeed due to inappropriate labeling or inappropriate recommendations based on assessment measures.

Persons with learning disabilities have problems processing information correctly (Levinson & Ohler, 1998) and may find facts about the world of work to which they have been exposed in texts, lectures, and literature to be both confusing and overwhelming. As a result, the ability to self assess abilities, deficits, interests and values is often impaired, and decision making of all types, including career decision making, becomes a difficult and problematic process. And even with greater numbers of students with LD enrolling in postsecondary institutions and the growing concern for their academic success, very few institutions are systematically monitoring these students’ academic performance or graduation and attrition rates (Vogel & Adelman, 1992).

Panagos and DuBois (1999) found that the importance of considering subjective factors (i.e. self-efficacy beliefs and outcome expectations) rather than only objective skills (i.e. aptitudes and abilities) was more influential in shaping the career development of adolescents with LD. When comparing the vocational expectations of students with and without disabilities, expectations of students with LD and other disabilities have been found to be lower with regard to status, pay, and working conditions of jobs (Fisher, Harnisch, Harnisch, Wermuth, & Rusch, 1992, as cited in Panagos & DuBois, 1999).

It may be suggested that the most critical factors for professionals working with individuals with isolated learning disabilities such as Math Disorder include the provision
of resources and support networks for this population, and a greater understanding of the importance of assessment measures and standardized test outcomes.

**Research Question**

This study examined the difference in grade attainment between students with a diagnosis of Math Disorder and students diagnosed with Math Disorder in conjunction with other learning disabilities. It was theorized that students with multiple learning disabilities including Math Disorder would have lower grades than students with Math Disorder only.

**Methodology**

**Participants**

A stratified random sampling procedure was used to select participants from the Center for Students with Disabilities at the University of Arkansas in Fayetteville, Arkansas. A computer database was used to randomly generate addresses of fifty students at the University of Arkansas utilizing services from the Center for Students with Disabilities. Seventeen males and seventeen females who had a diagnosis of Math Disorder in conjunction with other learning disabilities were identified and selected. In addition, eight males and nine females with a single diagnosis of Math Disorder were identified and selected.

**Procedures**

A consent form was constructed and signed by the Director of the Center for Students with Disabilities (CSD) giving the researchers consent to utilize student data for the study. A computer database was used to generate the data of the students selected to participate in the study. From the database, the following data were generated: Gender and ethnicity of the subjects, diagnosis of disorder(s), the average number of math classes taken during the 2002-2003 academic year at the University of Arkansas, and the individual GPA attained by each subject. With these data, averages were calculated and statistical analyses were performed comparing the GPA’s of the subjects across gender and disorder(s). All student identity information was removed, thereby protecting the identity of the subjects and the confidentiality of the data.

**Results**

Results were analyzed with a one-way ANOVA, between-groups design (Table 2). This analysis revealed no significant effect for GPA scores between the groups, F(3, 46) = 0.81; p = .49. The sample means are displayed in Table 1. Tukey’s HSD test failed to reveal a significant effect between groups by gender or disability (p > .05). Results for this analysis reveal that there was no measurable association for ACT, as well as
measurable effect size or power.

The box schematic plots demonstrate a positively skewed distribution, indicating that subjects of both genders with multiple learning disabilities generally had lower GPA’s than subjects of both genders with Math Disorder only, and that female subjects with Math Disorder only had the highest GPA’s among all four groups.

**Discussion**

The results indicated that the four groups of students’ scores were not significantly different at a statistical level, thereby indicating that the analyzed ACT scores in this study do not indicate a substantial difference in test achievement between students with multiple learning disorders including Math Disorder and students with Math Disorder only. This suggests that other factors such as experience, tutelage, self-efficacy beliefs, support services, additional assessment techniques, and a comprehensive psychosocial evaluation may provide a more inclusive and comprehensive presentation of a students’ academic achievement and struggles than ACT alone.

**Implications for Professionals**

This study may be particularly useful to professionals working in college counseling centers in which the growing population of students with disabilities is likely to increase the demand for services (Kelly, Sedlacek and Scales, 1994). Many factors influence students’ decisions to utilize or not utilize support services. Self-understanding, prior experience and reality testing, level of acceptance and denial, availability and quality of intervention, developmental life stage, motivation, and goals enter into the decision to acknowledge one’s learning disability and seek out support services (Vogel & Adelman, 1992).

Individuals with Math Disorder are capable of achievement in mathematics courses, with support, tutoring, and self-esteem building. If the individual believes that the disability is a challenge and not a deficit, the student will be more likely to work toward academic and career success. As part of a learning disabilities evaluation in particular, processing difficulties must be thoroughly assessed (Zera & Lucian, 2001).

By understanding how these students score with one disorder such as Math Disorder versus multiple disorders, it may be easier to assess what individualized program and assessment measures they need to accommodate their individual abilities, and it may be easier to assess overall how the learning environment is meeting their needs currently and thus contributing to their intellectual, social, personal, and professional growth and development. Through this information, professionals will be better able to serve this population, by perhaps developing a comprehensive battery of assessment measures based on the lower grades of students with multiple learning disabilities.
It may be more appropriate in the future to have developed a complete and comprehensive battery of assessment measures to look for Dyscalculia and other isolated learning disabilities in particular. Wong, Harris, & Graham (1991) suggest that a holistic approach to assessment of individuals with learning disabilities should be adopted that considers the dynamic interrelationships between cognition, affect, motivation, behavior, and learning (as cited in Zera & Lucian, 2001). All these factors comprise the individual’s potential at academic and career success, and the assessment measures aforementioned should be thorough and comprehensive enough to include an entire picture of the individual aside from a single estimated score leading to a label with potentially long-lasting, detrimental effects.

Understanding the impact having multiple learning disabilities has on students’ academic success may help professionals in the field to better understand their development of career maturity and efficacy. From this knowledge, a comprehensive battery of assessment measures may be developed to better assess these individual disorders, diagnoses, and subsequent needs.

A better understanding is needed of how students with multiple learning disabilities score on standardized tests compared to students with only Dyscalculia.

References


Toppo, G. (2003, January 21). Dyscalculia adds up to everyday problems. USA Today, p. 6D.


**Appendix A**

**Table 1:** ANOVA Summary Table for Study Comparing the Grade Point Averages between Students with Multiple Learning Disabilities and with Math Disorder only

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPA</td>
<td>3</td>
<td>1.25</td>
<td>0.42</td>
<td>0.81</td>
<td>0.05</td>
</tr>
<tr>
<td>Within Groups</td>
<td>46</td>
<td>23.5</td>
<td>0.51</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>24.75</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: N=50.

**Table 2:** Means Summary Table Study Comparing the Grade Point Averages between Students with Multiple Learning Disabilities and with Math Disorder only
<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>Post Hoc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males with Multiple Dis. (1)</td>
<td>17</td>
<td>2.24</td>
<td>0.56</td>
<td>1=2=3=4</td>
</tr>
<tr>
<td>Females with Mult. Dis. (2)</td>
<td>17</td>
<td>2.16</td>
<td>0.97</td>
<td>-</td>
</tr>
<tr>
<td>Males with Math Dis. (3)</td>
<td>7</td>
<td>2.22</td>
<td>0.28</td>
<td>-</td>
</tr>
<tr>
<td>Females with Math. Dis. (4)</td>
<td>9</td>
<td>2.61</td>
<td>0.62</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: The number in parentheses next to group names refers to the numbers used for illustrating significant differences in the last column titled “Post Hoc.”

![Figure 1](image)

**Figure 1**

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