



Dyscalculia

WHAT IS DYSCALCULIA?

Dyscalculia, also referred to as *math learning disability* (MLD), is a type of specific learning disability in mathematics. A universally recognized definition of dyscalculia has not been established; however, individuals with this condition have difficulties with mathematics that tend to persist despite effective instruction, and are not better explained by other factors (Soares et al., 2018). These difficulties may include *persistently weak number skills, slow or inaccurate math fact fluency, ineffective use of strategies during problem-solving, and unusual math errors* (Mazzocco & Vukovic, 2018). The definition contained in the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision (DSM-5-TR) was adopted by the WV legislature (§18-20-10) and is cited in WVBE Policy 2419: *Regulations for the Education of Students with Exceptionalities*:

Dyscalculia is an alternative term used to refer to a pattern of learning difficulties characterized by problems processing numerical information, learning arithmetic facts, and performing accurate or fluent calculations. If dyscalculia is used to specify this particular pattern of mathematic difficulties, it is important also to specify any additional difficulties that are present, such as difficulties with math reasoning or word reasoning accuracy.

HOW CAN NUMERACY SCREENERS DETECT RISK FOR DYSCALCULIA?

Grade-appropriate universal screening of key areas allows us to determine which students may be at risk for future difficulty in mathematics, including those who may have dyscalculia, and to decide which students need intervention. Evidence suggests early number sense may be a better predictor for future mathematics achievement than reading skill and general cognitive ability (Gersten et al., 2011).

Components of Successful Screening Measures in K-2

Kindergarten and First Grade	First Grade	Second Grade
Number Sense* Magnitude comparison (nonsymbolic [objects] and/or symbolic [numerals]) Counting* Naming the next or missing number in a series Digit Naming Fluent recognition of numerals in any order	Math Fact Retrieval Small-number addition/ subtraction Computation	Computation Concepts and Applications

Note: Components with an asterisk (*) are especially useful for early prediction of mathematics outcomes.
(Gersten et al., 2011; Mazzocco & Vukovic, 2018; The IRIS Center, 2018)

Early Intervention

Students found to be at risk for poor mathematics outcomes following universal screening should receive evidence-based intervention that is:

- » **explicit** (taught directly with modeling and frequent feedback)
- » **cumulative** (taught in a logical sequence, builds on existing knowledge)
- » **diagnostic** (based on student progress and needs, frequent practice and feedback)
- » **motivating** (hands-on, concrete representations [pictures/number lines], reward systems)

(National Mathematics Advisory Panel, 2008; Mazzocco & Vukovic, 2018)

Further, intervention should incorporate:

- » **concepts** (understanding concepts, operations, and relations)
- » **procedures** (using procedures flexibly, accurately, and efficiently)
- » **strategies** (formulating, representing, and solving problems)
- » **reasoning** (reflecting, explaining, and justifying)
- » **disposition** (seeing math as sensible, useful, and worthwhile)

(National Research Council, 2001)

Progress in mathematics skill development should be monitored at reasonable intervals to determine the effectiveness of intervention being provided, and to inform instructional decision-making.

Intervening early and effectively is associated with improved outcomes (Fletcher et al., 2018).

HOW IS DYSCALCULIA DIAGNOSED?

If a student has persistent difficulty with numeracy skills despite being provided increasingly intensive evidence-based intervention within a multi-tiered system of support framework, referral for a multidisciplinary evaluation may be warranted. While a school-based eligibility committee can identify a student as needing special education services as a student with a specific learning disability, a diagnosis of dyscalculia can only be rendered by qualified professionals, such as school psychologists, clinical psychologists, or neuropsychologists.

A comprehensive evaluation for a suspected specific learning disability in mathematics, including dyscalculia, could include the following components:

Background information, including birth history, family history, developmental history including speech and language, early educational history, risk factors associated with dyscalculia, early screening and benchmark assessments of literacy, and hearing/vision screenings

Documentation and analysis of instructional response data using reliable and valid progress monitoring measures demonstrating response to increasingly intense interventions and supports provided with fidelity

In-depth assessment of:

- | | | |
|---|--|--|
| » Number Skills
(magnitude judgment, counting, digit naming) | » Math Problem Solving /
Quantitative Reasoning | » Other areas as appropriate to
identify all special education
and related service needs, and
to rule out exclusion factors. (e.g.,
cognitive assessment, behavior rating
scales, occupational/physical therapy
evaluation). |
| » Math Calculation | » Mental Computation | |
| » Math Fact Fluency | » Math Motivation* | |
| | » Math Anxiety* | |

**Denotes a supplemental evaluation area to aid in developing a comprehensive treatment plan for a student with dyscalculia*

Academic difficulties associated with a specific learning disability, such as dyscalculia, cannot be the primary result of any of the following **exclusion factors**:

- » A visual, hearing, or motor disability
- » Intellectual disability
- » Emotional disturbance
- » Lack of appropriate instruction in English language arts, or mathematics
- » Cultural factors
- » Environmental or economic disadvantage
- » Limited English proficiency

WHAT HAPPENS AFTER DYSCALCULIA IS DIAGNOSED?

Depending on the severity and the students' needs, a student with dyscalculia may be eligible for special education and related services through an Individualized Education Program (IEP), or for accommodations through a Section 504 Plan. Regardless of the type of legal protections and educational supports for which a student with dyscalculia may qualify, evidence-based intervention should continue in order to facilitate further mathematics skill development and maintenance. This intervention should be provided in addition to any necessary accommodations that enable the student to be successful in the educational environment.

Resources

- » IRIS Center | <https://iris.peabody.vanderbilt.edu/>
- » Learning Disabilities Association of America (LDA) | <https://ldaamerica.org/>
- » National Center for Learning Disabilities (NCLD) | <https://www.nclld.org>
- » National Center on Intensive Intervention (NCII) | <https://intensiveintervention.org/>
- » National Council of Teachers of Mathematics (NCTM) | <https://www.nctm.org/>
- » National Research and Development Center on Cognition and Mathematics Instruction | <https://iesmathcenter.org/>
- » RTI Action Network | <http://www.rtinetwork.org/learn/what/rtiandmath>
- » The Science of Math | <https://www.thescienceofmath.com/>
- » Understood | <https://www.understood.org/>

References

- » American Psychiatric Association. (2022). Diagnostic and statistical manual of mental disorders (5th ed., text rev.).
- » Fletcher, J. M., Lyon, G. R., Fuchs, L. S., & Barnes, M. A. (2018). Learning disabilities: From identification to intervention. Guilford Publications.
- » Gersten, R., Clarke, B., Haymond, K., & Jordan, N. (2011). Screening for mathematics difficulties in K–3 students. Second edition. Portsmouth, NH: RMC Research Corporation, Center on Instruction.
- » National Mathematics Advisory Panel. (2008). Foundations for success: *The final report of the national mathematics advisory panel*. Washington, DC: U.S. Department of Education. Retrieved from <https://files.eric.ed.gov/fulltext/ED500486.pdf>.
- » National Research Council. (2001). Adding it up: Helping children learn mathematics. J. Kilpatrick, J. Swafford, and B. Findell (Eds.). Mathematics Learning Study Committee, Center for Education, Division of Behavioral and Social Sciences and Education. Washington, DC: National Academy Press.
- » Soares, N., Evans, T., & Patel, D. R. (2018). Specific learning disability in mathematics: A comprehensive review. *Translational Pediatrics*, 7(1), 48–62. <https://doi.org/10.21037/tp.2017.08.03>
- » The IRIS Center. (2018). MTSS/RTI: Mathematics. Retrieved from <https://iris.peabody.vanderbilt.edu/module/rti-math/>