

Dyscalculia

The Math Learning Disability: What every teacher needs to know

1

Dyscalculia

- Formerly known as Mathematics Disorder (DS<-IV TR)
- Under Specific Learning Disorders (DSM- 5)
- Problems with numbers
- Extreme difficulty with arithmetic skills
- Extreme difficulty in learning math concepts

2

Definitions of Dyscalculia

- Developmental dyscalculia is a structural disorder of mathematical abilities which has its origin in a genetic or congenital disorder of those parts of the brain that are the direct anatomico-physiological substrate of the maturation of the mathematical abilities adequate to age, without a simultaneous disorder of general mental functions. (1970a, cited in 1974, p 47)

3

Defining Dyscalculia

- “Dyscalculia is a condition that affects the ability to acquire arithmetical skills. Dyscalculic learners may have difficulty understanding simple number concepts, lack an intuitive grasp of numbers, and have problems learning number facts and procedures. Even if they produce a correct answer or use a correct method, they may do so mechanically and without confidence” (The National Numeracy Strategy (DFES (2001)).

4

Definitions of Dyscalculia

- Dyscalculia or developmental dyscalculia (Kosc, US Department of Education, and many scientific papers, this book)
- Specific disorder of arithmetical skills (ICD 10, see below)
- Mathematics disorder (DSM IV, see below)
- Specific learning disorder with impairment in mathematics (DSM 5, see below)
- Mathematics/mathematical learning difficulty, MLD (Mazzocco, Geary, and many scientific papers).
- So what is dyscalculia? Different authorities use different terminologies, and different criteria, and these official definitions, however vague, incoherent and unfounded, are nevertheless important from a practical point of view.

Butterworth 2019

5

Many different definitions

- Dyscalculia or developmental dyscalculia (Kosc, US Department of Education, and many scientific papers, this book) Specific disorder of arithmetical skills (ICD 10)
- Mathematics disorder (DSM IV)
- Specific learning disorder with impairment in mathematics (DSM 5)
- Mathematics/mathematical learning difficulty, MLD (Mazzocco, Geary, and many scientific papers).
- Butterworth 2019

6

Big Understanding

Brain impairment to particular parts of the brain involved in math cognition but that didn't affect general cognition

7

Definitions of Dyscalculia
No universal definition

An unexpected difficulty that some people have in dealing with mathematical problems (Attwood)

A condition that affects the ability to acquire arithmetic skills (The British Dyslexia Association, www.bda-dyslexia.org.uk)

8

Diagnostic Criteria for Mathematics Disorder (Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, American Psychiatric Association)

Mathematical ability, as measured by individually administered standardized tests, is substantially below that expected given the person's chronological age, measured intelligence, and age-appropriate education.

The math difficulties significantly interfere with academic achievement or activities of daily living that require mathematical ability.

If a sensory deficit is present, the difficulties in mathematics ability are in excess of those usually associated with it.

9

Definitions of dyscalculia

Difficulties in performing mathematics calculations of certain types (www.dyscalculiainfo.org)

A term referring to a wide range of life-long learning difficulties involving math. There is no single form of math disability, and difficulties vary from person to person and affect people differently in school and throughout life. (www.ld.org)

10

Called Many Things

Math Learning Disability

Mathematics Disorder

Math Dyslexia

11

Causes

Genes and Heredity

Brain development

Environment

Brain injury

12

Kids with dyscalculia need an IEP.

- 01 Not well known
- 02 I heard about it several years ago from an Argentinian psychologist
- 03 So important that teachers know because they are the first line of recognition
- 04 Difference between someone who struggles with math and someone who has dyscalculia

13

There is no cure...but

- No cure but there are many different types of interventions that can help your students
- Dyscalculia can't be treated with medication
- Students don't outgrow it
- INTERVENTIONS MAKE A DIFFERENCE! Students can improve their skills and manage the challenges.

14

Types of Dyscalculia

- Developmental - present from birth
- Acquired - usually as the result of a serious brain injury or a stroke
- Quantitative Dyscalculia - difficulties with counting and calculating
- Qualitative Dyscalculia - difficulties in comprehension of instructions; failure to master the skills required for an operation
- Intermediate Dyscalculia - Difficulties with operating with symbols or numbers

15

Types of Dyscalculia

- Verbal Dyscalculia:** Students with verbal dyscalculia have trouble writing numbers or equations that are dictated to them. They can copy numbers and equations but when they are verbally told these same things, they get confused. They also have trouble naming the signs, symbols and numbers. Students also have trouble naming the amounts of things.
- Ideognostic Dyscalculia:** Students can't retain the information. One day they can learn the numbers and operations but the next day they forget that exact lesson from the day before. They cannot remember any of what happened in the previous lesson. They cannot retain what they have learned. They have trouble understanding math concepts and relationships.

16

Types of Dyscalculia

- Lexical dyscalculia:** This is the opposite of verbal dyscalculia. Students with lexical dyscalculia can do the operations when given verbal instructions. However, when asked to write the number or do operations by copying them from somewhere, they can't do it. They have problems reading math symbols, including operation signs (+, - etc.) and numerals.
- Operational Dyscalculia:** Student with operational dyscalculia have trouble with math symbols and operations. They don't understand the symbols and what they mean when written or spoken to them. They have difficulty doing math operations.



17

Types of Dyscalculia

- Practognostic** - Students with practognostic dyscalculia can't differentiate between quantity and values of things in daily life. - For example students with this would have trouble comparing things to determine which one is larger.
- Graphical** - Students with graphical dyscalculia find it difficult to identify or complete math operations in written form. They cannot read or write or identify/perform math symbols and formulas. Can do mental math.



18

Types of Dyscalculia (Guillemot)

-  **Developmental Dyscalculia** - the term is used to distinguish the problem in children and youth as opposed to adults after severe head injury
-  **Pseudo-dyscalculia** - finding math difficult based on emotional blockage or confidence problem

19

Types of Dyscalculia

-  **Mathematical computation disorder** - This is the same as quantitative dyscalculia where students cannot understand and learn numbers and their operations
-  **Mathematical reasoning disorder** - This is a broader term and includes what has been discussed so far as well as 2 others.

20

Types of Dyscalculia

- Sequential Dyscalculia:** This is about counting numbers in a sequence. Students with this type of dyscalculia have trouble keeping time, determining orientation and measuring things.
- Acalculia:** Loss or absence of number intelligence because of brain injury, stroke or old age. People with this type of dyscalculia have trouble understanding math and doing mathematical operations.

21

1 of the Top 5 Learning Dis/Abilities

- 5-8 percent of elementary school children may have it (Strauss, 2003; www.idonline.org)
- Occurs equally in both genders
- Can overlap with dyslexia - some students have both
- Other disorders that can intersect with and interfere with math learning including visual and auditory processing, ADHD, and others

22

Other Conditions

- Dysexlexia
- ADHD
- Math Anxiety
- Genetic Disorders

23

Myths About Dyscalculia

- Myth #1:** All children with dyscalculia have the same math difficulties
- Myth #2:** Dyscalculia is another name for math anxiety
- Myth #3:** Dyscalculia is dyslexia but for math
- Myth #4:** Dyscalculia isn't very common.
- Myth #5:** Kids with dyscalculia can't learn math

24

Dyslexia and Dyscalculia

Over 50% of kids with reading disorders do poorly in math

Over 40% of students with a math disability do poorly in reading

25

Testing for Dyscalculia

www.ldonline.org
www.dyscalculiainfo.org

"Tests for Dyscalculia" by Tony Attwood, First and Best in Education, Ltd.- general comparative tests used to help identify areas of difficulty to allow for remediation planning




On-line diagnosis: The diagnosis does not carry official status, but you can obtain a letter of diagnosis, cost of \$550.
www.dyscalculia.org/diagnosis.html

There are no universally accepted tests for diagnosing dyscalculia.

26



Signs That Difficulties With Math are Beyond "Normal"

www.ld.org,
www.as.wvu.edu,
www.dyscalculia.org

-  Good in verbal skills, but difficulty with math skills
-  Good memory for printed words, but difficulty reading numbers or recalling numbers in sequence.
-  Good with general math concepts, but frustrated when specific computation or organization skills need to be used.

27




Identifying Dyscalculia

-  Focus on how the child does the mathematics
-  Explore the child's ability to compute

28

Identifying Dyscalculia

www.ldonline.org
www.dyscalculiainfo.org

-  Should include a one-to-one mathematics interview, including the use of manipulatives, i.e. coins, base ten block, geoboards, cuisenaire rods, tangrams, calculator. The interview should:
-  - note whether student talks to herself, draws a picture to help understand a situation, asks for problem to be repeated
-  - see if student can estimate before doing computations

29

Symptoms of Dyscalculia

30

Symptoms: Measurement/Data

- Problems with money
- Can't Count it
- Can't Make Change
- Can't Understand Time

31

Symptoms: Measurement and Data

- Has trouble telling time - numbers on the face of the clock are jumbled
- Has trouble with elapsed time
- Has trouble with speed and distance problems
- Has trouble with temperature

32

Symptoms: Measurement and Data

- Has trouble measuring things
- Has trouble following a schedule- often late
- Can't approximate how long a task will take
- Confuses past/future events

33

Symptoms: Measurement and Data

- Has trouble sequencing
- Trouble organizing and sorting - shape, size, color
- Difficulty judging weight or size
- Trouble comparing and contrasting - smaller/larger, taller/shorter
- Trouble with graphs and charts

34

Symptoms: Spatial/Temporal

- Left/Right Confusion
- Map Reading Difficulties
- Easily disoriented
- Easily confused by changes in route

35

Symptoms: Spatial/Temporal

- Lacks a sense of direction
- Spatial Orientation
- Reading a map - geographical locations of states, countries, oceans, streets
- Position/Direction
- Visual-spatial difficulties hinder comprehension of written mathematics

36

Symptoms: Memory

- Can't recall numbers
- Can't recall number facts
- Unorganized
- Poor mental arithmetic

37

Symptoms: Memory

- Trouble with short term and long term memory about math
- For example - will know facts one day and then doesn't remember them the next
- Trouble with math vocabulary
- Trouble with mental math
- Has trouble remembering specific facts and formulas for math calculations

38

Symptoms: Counting

- Rote counting
- Has trouble counting forward
- A inability to count backwards reliably
- Has trouble going up and down the number line

39

Symptoms: Counting

- Has trouble with number sequences
- Loses place when counting
- Skip Counting is Difficult
- Unsophisticated strategies - for example counting all instead of counting on; also counts on fingers

40

Symptoms: Calculations

- Trouble with arithmetic facts
- Trouble with all operations (addition, subtraction, multiplication, division)
- Trouble with problem solving

41

Symptoms: Calculations

- Has trouble with math games that require strategizing
- Difficulties with regrouping
- Has trouble understanding and remembering math symbols

42

Symptoms: Numbers

- Lacks number sense
- Mistakes include number additions, substitutions, transposition, omissions, and reversals
- Reverses or transposes numbers
- An inability to subitize even very small quantities

43

Symptoms:

- Has trouble recognizing and reading printed numbers
- Has trouble connecting the idea of a number and how it appears in the real world for example the number 2 being 2 marbles or 2 people.
- Struggles in general to connect a number to an amount
- Struggles to understand chronology

44

Symptoms: Numbers

- Poor understanding and confusion of math symbols
- Spelling Difficulties
- Difficulties with fractions

45

Symptoms: Numbers

- Difficulties with place value
- Difficulty working with zeros-trouble with 10's, 100's, 1000's

46

Symptoms: Mathematical Reasoning

- Has trouble finding more than one way to do a math problem
- Has trouble strategizing in math games




47

Symptoms: Mathematical Reasoning

- Has trouble recognizing patterns
- Has trouble estimating whether an answer is reasonable
- Has trouble problem solving





48

Symptoms: Math Disposition

-  Math anxiety
-  Math phobic
-  Lack confidence





49

Symptoms: Math Disposition

-  Feel overwhelmed especially in whole class situations; hates to do math publicly
-  Can develop learned helplessness
-  Gets lost in whole class instruction
-  Gets frustrated and embarrassed when asked to do math in front of the whole class

50

Symptoms: Other signs

-  Social Skills
-  Loses things often
-  Seems absent-minded
-  Can't remember names. Poor name/face retrieval. Substitutes names beginning with same letter

51

Symptoms: Sports

-  Poor athletic coordination, difficulty keeping up with rapidly changing physical directions like in aerobics, dance, and exercise classes.
-  Difficulty remembering dance step sequences
-  Difficulty remembering rules for playing sports
-  Physical Coordination
-  Keeping track of whose turn it is during games




52

Symptoms: Sports

-  Difficulty keeping score during games or remembering how to keep score in games, like bowling, etc. Often loses track of whose turn it is during games, like cards and board games
-  Limited strategic planning ability for games, like chess." Dyscalculiforum
-  May seem absent-minded

53

Symptoms: Music

-  Difficulty grasping concepts of formal music education
-  Difficulties with musical concepts such as reading music, keeping time etc.
-  Difficulty learning fingering to play an instrument

54

Strategies to Help Students with Dyscalculia
www.ldonline.org,
www.ld.org,
www.as.wvu.edu)

Use	Use graph paper to organize work and ideas
Use	Use different approaches to memorizing math facts, formulas, rules, etc.
Practice	Practice estimating as a first step to solve a problem
Encourage	Encourage students to work hard to "visualize" math problems, draw pictures, look at diagrams, etc.

55

Strategies to Help Students with Dyscalculia
www.ldonline.org,
www.ld.org,
www.as.wvu.edu)

- Encourage verbalizing while problem solving, this uses auditory skills which may be a strength
- Try to relate problems to real life experiences
- Provide uncluttered math sheets, preferably lined
- Use rhythm or music to help memorize math facts, etc.

56

Strategies to Help Students with Dyscalculia
www.ldonline.org,
www.ld.org,
www.as.wvu.edu)

- If possible, let student take tests one-on-one in the instructors presence.
- Allow extra time to complete work if needed
- Be aware if students become panicky, provide reassurance
- Monitor student progress on a frequent basis

57

Strategies to Help Students with Dyscalculia
www.ldonline.org, www.ld.org, www.as.wvu.edu)

- 01 First step must be to identify a student's strengths and weaknesses, understand how a student learns best
- 02 Use tutoring outside the classroom, with a one-on-one instructor
- 03 Provide a distraction free place to work
- 04 Encourage repeated reinforcement and specific practice

58

Strategies to Help Students with Dyscalculia
www.ldonline.org,
www.ld.org,
www.as.wvu.edu)

Teach	Teach important concepts to mastery
Allow	If needed, allow calculator use for basic operations to allow focus on problem solving
BE	BE PATIENT- Math can be a traumatic experience and is highly emotional because of past failures.

59

Math Intervention

- Immediate, Specific, Informative Feedback matters.

60

Thank you for joining in today!

Stay in touch:

- Drnicki7@gmail.com
- Call today [347-688-4927](tel:347-688-4927)
- Pinterest – [drnicki7](#)
- Instagram- [Guidedmathinaction](#)
- Facebook- [GuidedMath123](#)
- Websites- www.mathrunningrecords.com
- www.drnickinewton.com

6

61