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# Learning Disabilities

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## What is an LD?

A discrepancy between a person's level of achievement and their ability

Sounds easy enough, but a lack of agreement on operational definitions of achievement, ability, and discrepancy have caused numerous problems

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## Background

Gall had some of the first work on spoken language problems in the early 1800s

- Established differential patterns of specific strengths and weaknesses
- Argued that you had to rule out other confounding problems like MR or deafness

Broca and Wernicke did work on how lesions to certain areas of the brain impacted both speech production and information processing

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## Background

Otherwise intelligent children who could not learn to read were first studied in early 1900s

- Blamed on brain damage, "congenital word blindness," and lack of hemispheric dominance

Werner and Strauss concluded that children with general learning problems needed specialized education

- Introduced the concept of an IEP





## Background

The term "learning disabilities" was used by Kirk in 1963

- Excluded MR children and others with physical problems like blindness

"Specific learning disability" is used in federal language to avoid confusion with learning problems present in MR

- Same definition for an LD today as in 1966

Laws guaranteed children with LDs education in the "least restrictive environment"





## Federal Definition of LD

A severe discrepancy between achievement and intellectual ability in one or more areas

Oral Expression
Listening Comprehension
Written Expression
Basic Reading Skills
Reading Comprehension
Mathematical Calculations or
Mathematical Reasoning

## Background

LDs were put into DSM-III and DSM-IV has three main types of LDs

Individuals with Disabilities Education Act (IDEA '97) is most current federal regulation, but has no changes from original 1975 act

In the 2000s, biggest change has been in thinking about how to diagnose LDs





## Federal Definitions

Widely criticized due to

- Lack of indication that LDs are heterogeneous
- Failure to recognize LDs as continuing into adulthood
- Does not specify that information processing problems are "final common path" of LDs
- Fails to recognize that persons with handicaps or environmental limitations can have co-morbid LDs

Many other definitions are vague and difficult to operationalize and validate





## DSM-IV-TR Definitions

Diagnosed when achievement is substantially below one's ability

- Usually use 2 SDs as significant difference

Have to use individually administered achievement and intelligence tests

Three specific types of learning disorders in the latest DSM

## Reading Disorder

Reading achievement is substantially below that expected based on age, intelligence, and education

- Can be reading speed, accuracy, or comprehension

Disturbance substantially interferes with academic achievement or daily living

If sensory problem is present, difficulties are in excess of those usually associated with it





## Mathematics Disorder

Mathematical ability is substantially below that expected based on age, intelligence, and education

- Can be linguistic, perceptual, attention, or mathematical skills

Disturbance substantially interferes with academic achievement or daily living

If sensory problem is present, difficulties are in excess of those usually associated with it





## Disorder of Written Expression

Writing skills are substantially below that expected based on age, intelligence, and education

- Includes grammatical and punctuation errors, poor paragraph organization, spelling errors, etc.

Disturbance substantially interferes with academic achievement or daily living

If sensory problem is present, difficulties are in excess of those usually associated with it

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## Learning Disorder NOS

Learning Disorder, Not Otherwise Specified

Category for disorders that do not meet any specific criteria

May include all three areas of reading, written disorder and mathematics

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## The Discrepancy Problem

The "unexpected underachievement" assumption has been operationalized as the ability-achievement gap

Based on idea that these people are different than those with low IQ-low achievement

Research about reading LDs in four areas has not supported these differences

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## Reading Disabilities

Research hasn't shown that LD versus non-LD people respond differently to interventions

Ability-achievement gap doesn't predict response and the same interventions can be used with both groups to improve reading

Cognitive abilities that underlie reading skills show small to non-existent differences

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## Reading Disabilities

Development of reading skills is not different in LD versus non-LD with low achievement
- Both still show longitudinal deficits, no change in degree

No evidence for genetic or neuroimage differences in LD vs non-LD twins

Points to the discrepancy model as being non-relevant to treatment planning at all

Same patterns for other types of LDs





## Psychometric Factors

Validity (as shown) is not high for using IQ-achievement discrepancy

Multiple reliability issues

Correlation between IQ and achievement should be controlled for
- Otherwise you'll overidentify LDs in high IQs and underidentify in low IQs





## Psychometric Factors

Measurement errors for difference scores are higher than for either of the original scales

Lack of stability for groups in terms of relative standings and potential cutoff points

Overall, the use of an IQ-Ach discrepancy for diagnosing LDs lacks empirical support

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## Exclusionary Factors

Several factors exclude one from being diagnosed with an LD

- Mental deficits
- Sensory disorders
- Cultural / linguistic differences

Problem is in determining from behavioral evidence whether an LD is due to these factors or not

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## Social & Economic Disadvantage

Limited information on how these impact expression of an LD

Race is a significant predictor of reading ability, even with other SES factors controlled for

No difference in how advantaged versus disadvantaged children respond to intervention

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## Heterogeneity

LDs are domain-specific, but many children have co-morbid LDs

Federal guidelines for disorders do not match up well with research domains:

Oral expression, listening comprehension, basic reading, reading comprehension, math calculations, math concepts, and written expression

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## Empirically Supported LDs

Reading disorder – word recognition

Reading disorder – comprehension

Reading disorder – fluency

Mathematics disorder

Reading-mathematics disorder

Disorders of written expression – handwriting, spelling, text generation





## Heterogeneity

High LD-ADHD overlap, especially in mathematics disorders

- Both have executive function difficulties

Social-emotional difficulties also highly present

- Likely secondary to learning difficulties





## Reading Disorders

Dyslexia / Word-level RD

- Caused by difficulties in accurate and fluent single word decoding
- Remediated by development of world recognition and phonological processing skills
- Continuum-based disorder
- IQ tests not needed for identification

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## WLRD Epidemiology

Varying estimates, from 10-17%

Over 1 in 3 children read below basic level of proficiency

Dyslexia is most common form of LD, with 80-90% of children in special education having reading problems

No sex differences in prevalence rates

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## WLRD Facts

LDs are a persistent deficit, rather than developmental lag

- Hampered by lack of systematic, effective intervention

Many different theories regarding cause of WLRDs

- Focus on development of single-word reading

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## Neurobiological Factors

Evidence for neuro differences, such as symmetrical planum temporale and incraeased ectopias

- Involved in visual and language processing

Functionally, there are differences in brain activation of people with WLRDs

Strong genetic heritability for reading ability overall, not specific types of LDs

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## Reading Comprehension LD

Evidence that RCLD can occur in absence of WLRD

Tests used to diagnose compare word recognition or listening comprehension to reading comprehension
- IQ tests not used for dxo

Prevalence rates estimated between 5-10%





## Reading Fluency LD

Fluency is distinct from both word recognition and comprehension
- Related to rapid naming and processing speed

Impacts comprehension, remediation will require different approach than either WLRD or RCLD





## Mathematics LD

Vague definitions for Math LDs cause problems in research and assessment

Likely a result of working memory and executive function deficiencies

Not well-studied, but unlikely that a subgroup with problems only in math concepts exists

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## Subgroups of Math LDs

- Historically, characteristics in math were described under the term "developmental dyscalculia," which refers to the failure to develop arithmetic competence.
- Kosc identified six separate math disorder subtypes

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## Subgroups of Math LDs

1. Verbal dyscalculia: an inability to name mathematical amounts,numbers, terms, symbols, and relationships.
2. Practognostic dyscalculia: an inability to enumerate, compare, and mathematically manipulate objects, either pictured or real.
3. Lexical dyscalculia: a disorder in reading mathematical symbols.

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## Subgroups of Math LDs

4. Graphical dyscalculia: a disability in writing mathematical symbols
5. Ideognostical dyscalculia: a disorder in understanding mathematical concepts and in performing calculations mentally
6. Operational dyscalculia: a disability in performing computational operations

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## Written Expression LDs

Little research on these compared to reading and math LDs

Extremely high comorbidity with RLD and MLD, rarely seen alone but is possible

High comorbidity rate with ADHD in regards to handwriting problems





## Identifying LDs

Aptitude-Achievement Discrepancy

- Poor support for this model, but most widely used in diagnosing LDs

Low Achievement Model

- High validity, but controversial
- Fails to use follow an "unexpected underachievement" approach





## Identifying LDs

Intraindividual Differences Model

- Compares abilities within individual
- "Flat profile" = no LD
- Little support in terms of identifying who will respond to interventions

Response to Instruction Model

- Uses repeated assessment to determine if someone progresses or not with intervention
- Strong validity and reliability

## Hybrid Model of Assessment

Combing low achievement and response to intervention models may be most reliable and valid method

Retains concepts of discrepancy and unexpected underachievement, while improving identification of true LDs