[Required Information]

That section must be filled by the content editor/writer.

The information in that section is necessary for the web developer.

While you are reviewing the content make sure you apply some best practices:

* HTML first, if you have an alternative version (word, pdf) a link will be on the page.
* Use only the predefine style in word, Heading 1 Heading 2 etc.
* Anywhere there is link we should have the detail in bracket
  + example:
    - [*EN 301 549* (PDF, 2.3MB)](https://www.etsi.org/deliver/etsi_en/301500_301599/301549/03.02.01_60/en_301549v030201p.pdf)
    - [*EN 301 549* (PDF 2.3Mo) (disponible seulement en anglais)](https://www.etsi.org/deliver/etsi_en/301500_301599/301549/03.02.01_60/en_301549v030201p.pdf)

## **Short Introduction / Description**

Brief descriptions and characteristics of common types of cognitive disabilities.

## **Category**

Accessibility Fundamentals

## **Sub-Category**

About Disabilities

## **Page Title**

Cognition Disabilities

## **Target Audience**

Everyone

## **Keywords**

Intellectual disabilities, reading disability, dyslexia, dyscalculia, math disabilities, computational disabilities, ADHD, Attention Deficit Hyperactivity Disorder, autism spectrum disorders (ASD), non-verbal learning disability, adaptive technologies, cognitive disabilities, cognitive impairment, learning disability, text to speech, augmentative and alternative communication (AAC), smart pens, Asperger Syndrome (AS), speech recognition software

# **Cognitive Disabilities**

Cognitive impairments take many forms, including short and long-term memory impairments, and perceptual differences. Language impairments, including dyslexia and temporary impairments associated with those trying to learn new languages, are also common cognitive problems. Normally a combination of adaptive computer technologies is used to help people with cognitive disabilities.

Cognitive disabilities may occur on their own or result from a variety of conditions or injuries such as traumatic brain injury. They may also co-occur with other types of disabilities.

## Intellectual Disabilities

Definition: Intellectual disability is characterized by significant limitations both in intellectual functioning (reasoning, learning, problem solving) and in adaptive behavior, which covers a range of everyday social and practical skills.

According to the American Association of Intellectual and Developmental Disabilities, anindividual has intellectual disability if they meet three criteria:

* Their IQ is below 70 to 75
* There are significant limitations in two or more adaptive areas (skills that are needed to live, work, and play in the community, such as communication or selfcare)
* The condition manifests itself before the age of 18

Characteristics: People with an intellectual disability may:

* Sit up, crawl, or walk later than other children
* Learn to talk later or have trouble understanding and speaking
* Find it hard to remember things
* Have trouble understanding social rules and cues
* Have trouble seeing the results of their actions
* Have trouble solving problems and decision-making

## Reading and Dyslexia

Definition: Dyslexia is a learning disability that impairs a person’s ability to read. The disability could be the result of a congenital difference, an injury, delayed development, a neurological or physical disability. Professionals identify and diagnose specific reading disabilities, such as Dyslexia in children and teenagers. Often the diagnosis of a learning disability will include components of a reading impairment.

People with adult-onset dyslexia typically develop after a brain injury or in the context of dementia. Recent research has shown a number of genes that may predispose a person to developing dyslexia. Dyslexia can be inherited in some families.

Characteristics: Although the disorder differs from person to person, reading disabilities may include:

* An inability to perceive text or to process the meaning of words, phrases and ideas
* Read at lower levels than expected despite having normal intelligence
* Difficulty with phonological processing (the manipulation of sounds), spelling, and / or rapid visual-verbal responding

## Math and Computation

Definition: Math and computational disabilities impact a person’s ability to learn and communicate math. Dyscalculia involves an inability to understand arithmetic and how to calculate. This disability can be complicated by dysgraphia, an inability to draw or copy figures and graphs, and by anxiety. Dyscalculia may be congenital or result from an injury, disease, or aging.

Characteristics: According to Understood’s What is Dyscalculia and other sources, common signs of dyscalculia include difficulty with:

* Grasping the meaning of quantities or concepts like biggest vs smallest
* Word problems that require math skills
* Understanding that the numeral 4 is the same as the word four, and that these both mean four items
* Basic math concepts, such as addition, subtraction, multiplying, and dividing
* Remembering math facts, such as multiplication tables
* Math operations, such as such as carrying, borrowing, and regrouping
* Time and money, such as estimating time, counting money and making change
* Spatial reasoning, such as judging speed or distance
* Sequences of numbers, such as phone numbers and addresses

## Attention Deficit Hyperactivity Disorder

Definition: Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder that affects both children and adults. Symptoms usually appear by age 7. While people do not outgrow ADHD, they do learn to adapt. ADHD is characterized by difficulties with attention, impulsivity and hyperactivity that can interfere with daily functioning and relationships.

Characteristics: the main symptoms of ADHD are:

* Inattention: difficulty focusing, forgetfulness, distractibility and disorganization
* Impulsivity: acting without thinking, interrupting others and difficulty waiting for one’s turn
* Hyperactivity: fidgeting, restlessness, excessive talking, and inability to sit still

## Autism Spectrum Disorders

Definition: According to the World Health Organization: Autism spectrum disorders (ASD) refers to a range of conditions marked by some degree of impairment in social behaviour, communication and language, and a narrow range of interests and activities that are both unique to the individual and carried out repetitively.

ASD begins in childhood and tends to continue into adolescence and adulthood. People with ASD often have co-occurring conditions, such as epilepsy, depression, anxiety and attention deficit hyperactivity disorder (ADHD). The level of intellectual functioning in individuals with ASDs is extremely variable, extending from profound impairment to superior levels.

Characteristics: People with ASD may exhibit some of the following traits:

* Difficulty with social interaction: making and maintaining relationships, understanding social cues, and understanding or talking about feelings
* Communication difficulties: using and understanding language, making eye contact, giving unrelated answers to questions and repeating words or phrases over and over
* Difficulty with change, such as getting upset by minor changes
* Narrow interests, such as having obsessive interests
* Repetitive behaviour, such as flap their hands or lining up objects
* Unusual motor movements, such as flap their hands and rock their body
* Sensory sensitivities: unusual reactions to the way things sound, smell, taste, look, or feel

## Non-verbal Learning Disability

Definition: According to the University of Michigan, Michigan Medicine resource, Your Child Development and Behavior Resources, Non-verbal Learning Disability (NLD): Nonverbal Learning Disability is very much like Asperger Syndrome (AS), in which people with the syndrome have normal intelligence and language development, but have trouble with social skills, sensory input, and making transitions. AS and NLD are generally thought to describe the same kind of disorder but to differ in severity, with AS describing more severe symptoms.

Characteristics: Some of the signs of NLD include:

* Great vocabulary, verbal expression and reading comprehension
* Excellent memory recall for details
* Attention to detail, but missing the big picture
* Poor abstract reasoning and problem solving
* Difficulty reading maps, interpreting graphs, and solving puzzles and time management
* Difficulty with planning, organizing, and managing tasks
* Physical awkwardness, poor coordination
* Poor social skills
* Trouble understanding social cues, body language, sarcasm and humour
* Trouble adjusting to changes
* Anxiety, depression, low self-esteem

## Barriers for People with Cognitive Disabilities

From the W3C’s Web Accessibility Initiative and other sources:

* Complex sentences and unusual vocabulary.
* On websites and other technologies, complex page layouts and navigation.
* Long passages of text without images, graphs, or illustrations to help explain concepts.
* Animated, blinking, or flickering images.
* Audio with no option to turn it off.
* Web browsers and media players that do not provide a control to turn off animations or audio.
* Complex visual designs.
* Social isolation discrimination.

## Reading and Dyslexia Challenges and Solutions

Perceives words as floating and not in a line:

* Can use a special font developed for dyslexia which weights the letters down and makes similar figures appear differently.
* May be granted additional time to complete tasks.

Perceives words differently than others, such as by confusing the letters p, b, d, and q:

* Can change the font, contrast or add an underline to text to keep words in line.
* May be granted additional time to complete tasks.

Requires additional time to read and process content:

* Can extend time-outs and return to the same location on the page.
* Can use voice output technology to reinforce reading content with the audible version. Can use screen readers which highlight the word or phrase being read to assist with tracking.
* Can use enhanced visible focus indicators to keep track of their position on the page.
* Can use special programs or dictionaries which present words with pictures.
* May be granted additional time to complete tasks.

Has the burden of deciphering content from the way it is presented:

* May apply a custom style sheet.

May have difficulty solving problems presented through security features such as CAPTCHA:

* Support the ability to change the type of problem presented.

May have difficulty processing content through visual means:

* Can use voice output technology to reinforce reading content with the audible version. May be granted additional time to complete tasks.

Difficulties with spelling:

* Spelling and grammar checker.
* Dictation.

## Math and Computation Challenges and Solutions

Inability to distinguish right from left in graphic images:

* Can read data in a data table or text description as an alternative to graphic representations of data.
* May be granted additional time to complete tasks.

Inability to perform calculations:

* Can use an online reference sheet with common equations.
* Can use an onscreen calculator.
* May be granted additional time to complete tasks.

## Adaptive Technologies and Adaptive Strategies

Here are some commonly used products and strategies:

* Cueing/Memory Aids
* Software that includes text to speech, word prediction, and spell check
  + For example, Word Q Pro
* Simplified interfaces
  + For example, Medialexie
* Simplified content
  + For example, workbooks, picture boards, charts, pencil grip to aid in writing skills, educational toys and games, blocks, models of common objects, letters, and numerals
* Augmentative and alternative communication (AAC) devices
* Synchronized speech and highlighting
* Visual / audio alternatives to text in signage, messages, instructions
* Direct and immediate help
* Smart Pens
  + Pens for recording lectures, note taking and improving handwriting.
    - For example, Echo Smart Pen
  + Pens that can scan and store text and transfer it to a word processor.
  + Pens with scanning capabilities for reading comprehension.
* Digital highlighters that instantly transfer words on paper to a digital device for easy note-taking and deeper comprehension.
* Personal tutors for students to practice their learning and increase fluency by building new words, recalling learned words, discriminating between words and reading controlled texts.
* Online grammar checkers
* Software that includes color highlighters, notetaking, and bookmarking functions
* Educational Software
  + For example, Kurzweil 3000
* Speech Recognition
* Voice Recorders

Here are links to tutorials:

* [Kurzweil 3000 tutorial](https://www.kurzweiledu.com/products/product-guides.html)
* [Word Q Pro Tutorial](https://www.quillsoft.ca/tutorials-wordq)
* [Medialexie Tutorial (French only)](http://medialexie.ca/logiciels-medialexie/)

### For Communication:

* Allowing adequate time to exchange information
* Speaking slowly
* Checking for understanding
* Choosing a quiet location for communicating
* Feedback mechanisms
* Low-tech message boards
* Computerized voice output communication aids
* Synthesized speech