

BRAIN

Better underRstanding And prevention
of Neuropsychological difficulties

TOOLKIT FOR PROFESSIONALS WORKING
WITH **YOUTH AND ADULT CLIENTS**

THEORETICAL BOOKLET

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Preamble

WHY TAKE INTEREST IN NEUROPSYCHOLOGICAL FUNCTIONING?

Neuropsychological functioning encompasses a number of cognitive functions and, to a degree, is representative of overall brain functioning.

Understanding neuropsychological functioning is important because it includes processes like memory, attention, concentration, problem solving, and processing speed. When neuropsychological functioning is impaired, it can affect everyday life in all sorts of ways. Examples include difficulties remembering appointments, concentrating in school, following instructions, understanding other people, etc.



HOW IS THE TOOLKIT USED?

Health professionals can use the theoretical booklet with adolescents (ages 12–17) and young adults (ages 18–30).

This toolkit contains information on neuropsychological functioning, neuropsychological difficulties and their impacts on everyday life, which may be helpful for screening. Particular attention is paid to:

- Protective factors associated with adequate neuropsychological functioning;
- Risk factors associated with neuropsychological difficulties;
- Consequences of untreated neuropsychological difficulties.

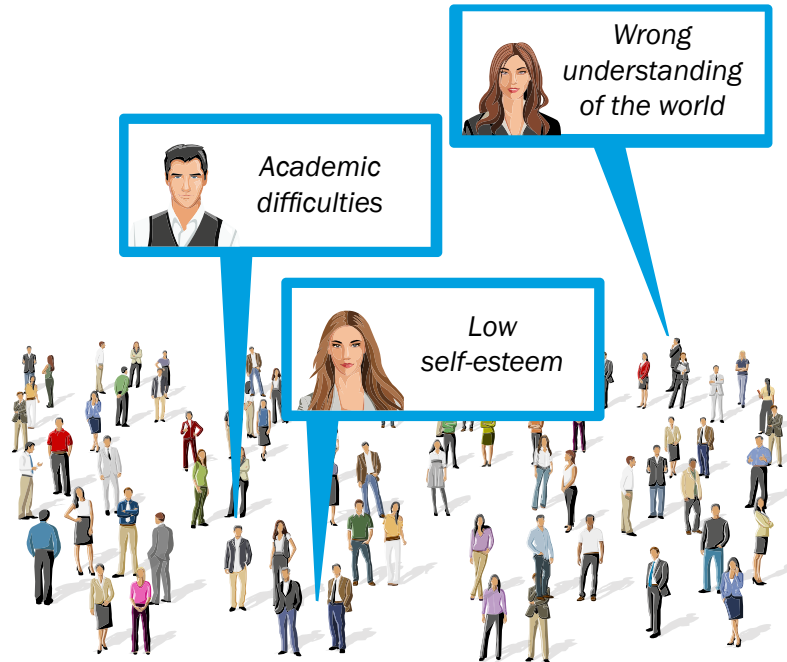
Clinical vignettes are presented in other booklets (“clinical booklets”). They provide concrete examples of the manifestations of neuropsychological difficulties in everyday life. It is recommended to start with the theoretical booklet and then moving on to a clinical booklet, depending on the age of the person you are working with.

Keep in mind that the purpose of this toolkit is to stimulate the interest in neuropsychological functioning among youth, young adults and the people who work with them. It also aims to raise awareness of some strategies that may be used to mitigate the impact of neuropsychological difficulties on daily life.



Keep in Mind

- Each person has their own unique situation, so no one intervention method fits everyone's needs. That's why it is so important to take a personalized approach. Neuropsychological difficulties impact everyone differently (for example: problems at school, behavioural issues due to a lack of understanding of one's surroundings, low self-esteem, etc.).
- If a person has neuropsychological difficulties that are too severe and/or that hinder their daily functioning, a qualified professional should be consulted (for example: a psychologist or neuropsychologist).



Major Cognitive Domains*

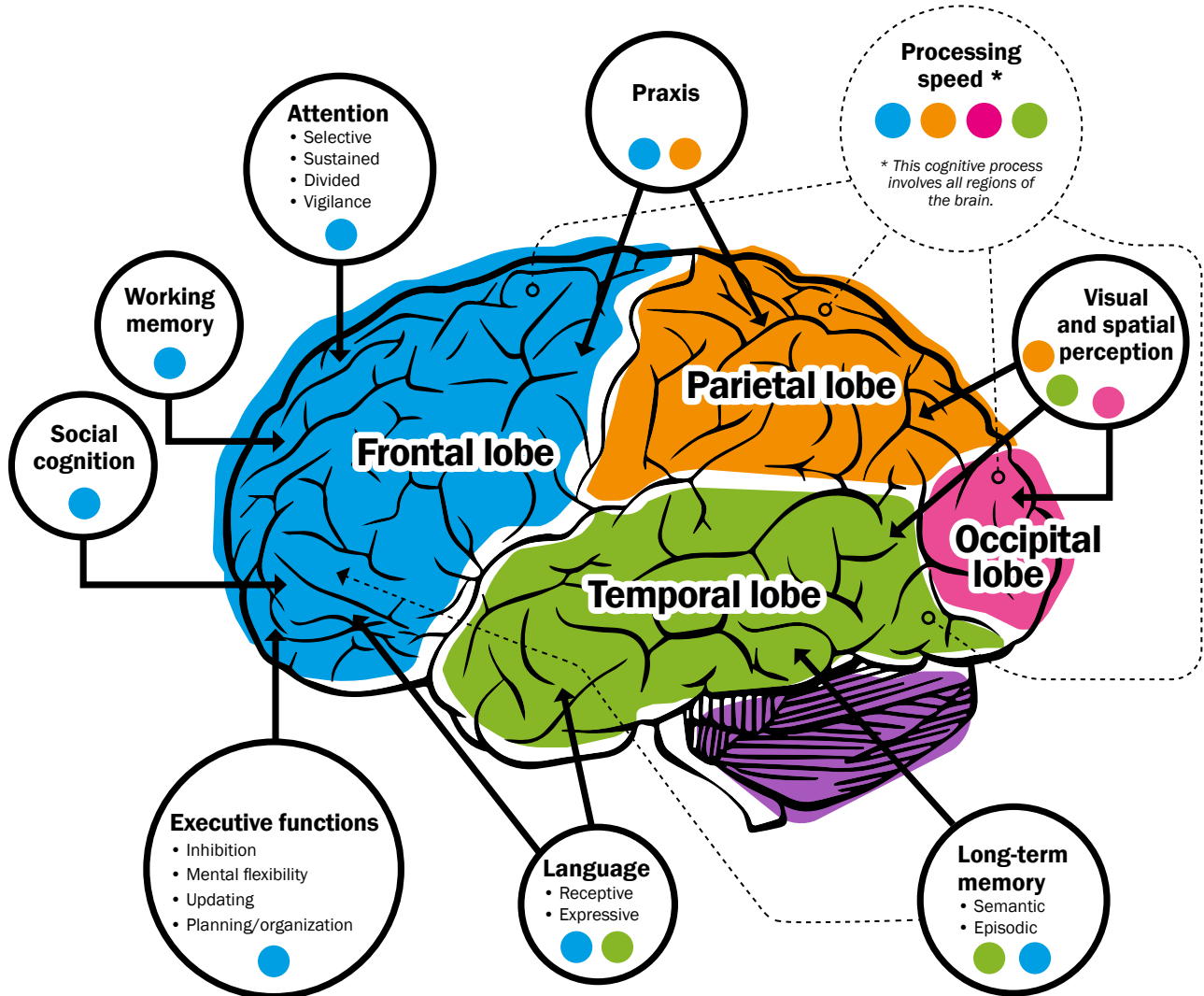
● Frontal lobe
 ● Parietal lobe
 ● Occipital lobe
 ● Temporal lobe

Processing speed	● ● ● ●	Speed or rhythm at which a person processes information or initiates mental operations or tasks.
Attention	●	Capacity to attain a level of alertness that allows us to focus on various situations.
Working memory	●	Ability to temporarily maintain and manipulate information in memory, for short time periods (seconds).
Long-term memory	● ●	Ability to remember everyday life events, things learned in school, etc. Long-term memory processes include episodic memory (events in our personal lives) and semantic memory (general knowledge).
Executive functions	●	Processes involved in new or complex situations. These include inhibition, mental flexibility (or cognitive flexibility), updating, and planning/organization. These processes coordinate other cognitive functions, much like an orchestra conductor.
Praxis	● ●	Ability to coordinate purposeful movements.
Visual and spatial perception	● ● ●	Ability to perceive surrounding objects according to their orientation, shape, colour, distance, and location in space / the environment.
Social cognition	●	Processes that support our understanding of the people around us and social interactions.
Language	● ●	Allows for communication and includes expressive language (speaking and writing) and receptive language (understanding what is heard or read).

*These are cognitive domains usually assessed in neuropsychology, but other cognitive processes also exist.

Cognitive Processes and the Brain

Cognitive processes are supported by different parts of the brain, but they rarely rely on a single brain region. This figure shows the brain regions most often associated with the main cognitive domains.



Understanding Lifestyle Habits

An explanatory model that illustrates various risk factors for neuropsychological difficulties and the consequences associated with such difficulties is presented on the following page. This model includes components borrowed from the biopsychosocial approach.

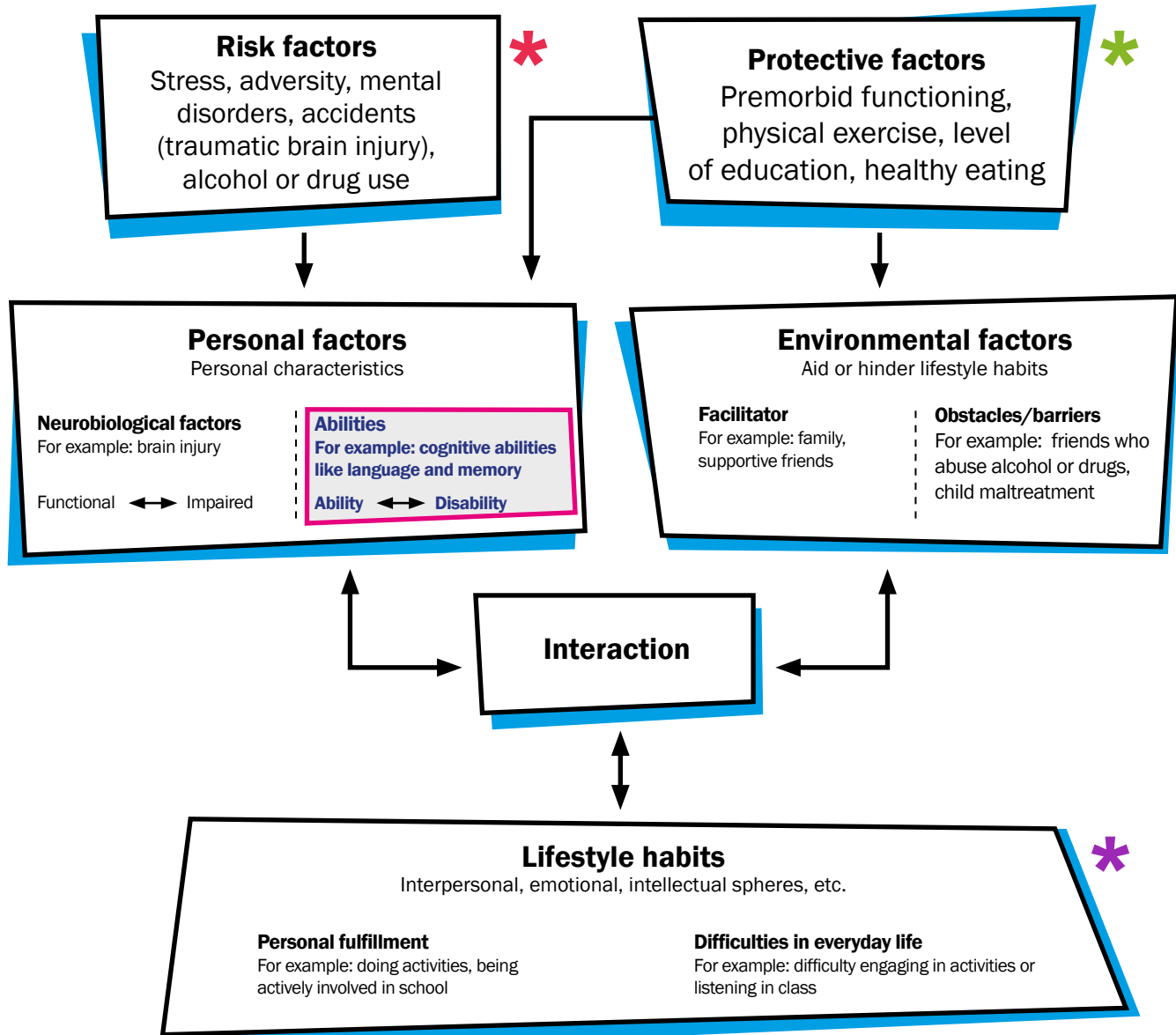
Environmental factors can help or hinder adequate functioning and healthy lifestyle habits.

Personal neurobiological factors may lead to difficulties in certain cognitive processes but can also contribute to healthy neurobiological functioning. Further, a person's **aptitudes (cognitive abilities)** may determine whether or not they are able to perform mental or physical activities.



Keep in Mind

- Personal factors **interact** with environmental factors and affect day-to-day functioning and influence lifestyle habits.
- Disruptions in **lifestyle habits** can cause functional difficulties. Conversely, preserved lifestyle habits can help improve everyday functioning.



*This model is adapted from the Human Development Model – Disability Creation Process (HDM-DCP, 1998)¹

The list of protective and risk factors presented in the following pages is not exhaustive. Other factors may come into play.



Protective Factors

ENVIRONMENT

The quality of the physical environment where a person grows up can affect neuropsychological functioning. For example:

- **Adequate material resources** (sanitary conditions, availability of toys and books, etc.) are associated with intellectual stimulation during childhood.²
- **Middle and high socio-economic status** neighborhoods can also have positive impacts on intellectual functioning among young children.³
- Having **stimulating life experiences** in their environment positively impacts a child's motivation to seek learning opportunities later on.³

SOCIAL INTERACTIONS

Friendships and the quality of interpersonal relationships are factors associated with better general functioning.⁴ For example:

- Social interactions may have a positive effect on the **brain's ability to adapt** by providing a dynamic and stimulating environment.⁵
- Studies report a positive relationship between growing up in a large family and **social cognition abilities**.^{6,7}
- **Interactions with relatives, siblings, and peers** also represent learning opportunities. They may promote development of the processes underlying the ability to understand social interactions and other people.

EDUCATION

Education is considered a protective factor for neuropsychological functioning. For example:

- **Cognitive decline** associated with aging and the development of dementia is likely to be delayed in individuals with higher levels of education.⁵
- Education draws on a number of different mental processes. Exercising these processes could promote **optimal use of different areas of the brain**.
- **Hobbies** like playing a musical instrument or juggling can provide learning experiences associated with reduced risk of cognitive decline later in life and growth in certain brain structures.⁵



PREMORBID FUNCTIONING

Premorbid functioning refers to an individual's functioning before the onset of impairment (for example: before a traumatic brain injury or the onset of a mental disorder).⁸

- Good **premorbid academic functioning** is associated with better neuropsychological functioning after a traumatic brain injury.⁹
- For certain mental disorders, poorer social and professional premorbid functioning could have a negative impact on **long-term functioning**.¹⁰ Poor premorbid social functioning is also associated with more severe **clinical symptoms** in people at high risk of developing a mental disorder.¹¹

HEALTHY LIFESTYLE HABITS

Healthy lifestyle habits (for example: physical activity, healthy eating) are another protective factor for neuropsychological functioning. For example:

- A **positive relationship** has been demonstrated between physical activity and academic performance and cognitive functioning.¹²
- Activities like cycling, brisk walking, swimming, and jogging are associated with the maintenance of **brain health** and could even increase the **brain's ability to adapt** to adverse life events.⁵
- There is data to suggest that **aerobic exercise** is more strongly linked to good neuropsychological functioning in adulthood.¹²
- **Healthy eating** that involves a diet high in fruits, vegetables, fish, and whole grains is associated with better **executive functioning**. Conversely, poorer executive functioning has been associated with the consumption of high-sugar foods (sweet snacks and beverages) and red and processed meat.¹³



Keep in Mind

- Various **protective factors** may help **preserve** neuropsychological functioning.
- For example, a person who suffered a traumatic brain injury due to an accident (risk factor) may suffer brain damage (neurobiological factor) that could lead to difficulty concentrating at school or work (lifestyle habits). However, good premorbid functioning (i.e., functioning prior to impairment) combined with a supportive social network (interaction between personal and environmental factors), could reduce concentration difficulties.





Risk Factors

STRESS

- Significant amounts of stress over an extended period of time can cause considerable damage to **brain structures and connections**.¹⁴
- The cognitive functions that are the most severely impaired may differ **depending on the developmental period** at which the stress occurs (for example: childhood, adolescence, adulthood). Notably, impairments to memory and executive functions have been observed.¹⁴
- The **duration of the exposure to stress** can also exacerbate its effects on the brain and cognitive functioning. Early and prolonged exposure to stressful situations is associated with a greater negative impact on neuropsychological functioning.¹⁴

ADVERSITY

Adversity refers to potentially traumatic situations ranging from child maltreatment to events such as bullying, having a parent with mental illness, or parents' divorce. Child maltreatment is considered an extreme form of adversity.¹⁵ Partly because of the stress they cause, adverse situations have repeatedly been associated with neuropsychological impairments. For example:

- **Child maltreatment** has been associated with a range of neuropsychological difficulties in working memory, attention, intellectual ability, and processing speed.¹⁶
- The neuropsychological impacts of exposure to adversity at a young age may only be **observed years later**.¹⁷ However, such difficulties tend to **lessen over time** and are more pronounced in childhood than adulthood.¹⁶



ACCIDENTS AND TRAUMATIC BRAIN INJURY

Traumatic brain injuries occur when the brain hits the skull. People who suffer these injuries are more likely to present certain neuropsychological difficulties.¹⁸

- **Cognitive processes that may be affected:** attention, memory, executive functions, visuospatial functions, processing speed, social cognition.^{19,20}
- The **duration of the consequences is variable:** the consequences can last only a short time or be permanent, depending on the severity of the brain injury and the care received by the individual.¹⁸
- A number of **different types of accidents can cause traumatic brain injuries:** traffic accidents, falls, sports and recreational accidents, and accidents at work.¹⁸

MENTAL DISORDERS

Several mental disorders are associated with neuropsychological difficulties. Here are some examples for mental disorders in adulthood:

- **Schizophrenia:** A range of difficulties with varying degrees of severity across all cognitive domains. The most significant difficulties are observed in episodic memory, processing speed, executive functions, and social cognition.^{21,22}
- **Depression:** Executive functions, working memory, episodic memory, and attention.²³
- **Obsessive-compulsive disorder:** Executive functions, episodic memory, processing speed, and attention.²⁴
- **Bipolar disorder:** Executive functions, social cognition, episodic memory, working memory, and processing speed.^{25,26}
- **Attention deficit hyperactivity disorder (ADD/ADHD):** Working memory, episodic memory, and sustained attention.^{27,28}



CONSUMPTION OF PSYCHOTROPIC SUBSTANCES

Drug and alcohol consumption is also a risk factor for neuropsychological difficulties. Different drugs are associated with various neuropsychological difficulties in people without mental health issues. Here are a few examples:

Methamphetamine (“speed”)

- Difficulties in executive functions and processing speed in chronic users.²⁹

MDMA (“ecstasy”)

- Ecstasy users **perform more poorly** than non-users in visuospatial tasks.³⁰

Cannabis

- Difficulties with sustained attention, working memory, planning and inhibition.³¹
- Both occasional and regular use can have impacts that last for a period of weeks following the end of consumption.^{32,33,34}
- **Long-term consequences** are more common if cannabis is consumed in large quantities and started from a **young age**. Exposure to cannabis during adolescence has been linked to more significant neuropsychological difficulties.³⁵

Alcohol

- **Long-term abuse:** difficulties with executive functions (inhibition, flexibility, planning), attention, episodic memory, and visuospatial orientation.³⁶
- Exposure to alcohol or other drugs (for example: cocaine) **in utero** via use by the mother also has negative effects on the development of cognitive functions.³⁷

These factors do not always cause neuropsychological difficulties. The effects vary from person to person.



Potential Consequences of Neuropsychological Difficulties

When neuropsychological difficulties go untreated, they can have negative consequences. Development of various spheres of functioning may be altered over time.

SOCIAL SPHERE

Neuropsychological difficulties can affect interpersonal relationships in many ways. Here are some examples:

- **Limited social skills:** difficulty making new friends or maintaining long-term friendships.³⁸
- **Impaired family functioning:** linked to difficulties in communication, problem solving, and emotional investment.³⁹
- **Perception of relationships:** more negative perception of family or romantic relationships, reduced marital satisfaction.³⁹
- **Quality of life:** more negative perception of quality of life due to relationship difficulties.⁴⁰

EMOTIONAL SPHERE

Neuropsychological difficulties are associated with various **psychological and emotional difficulties**. Here are some examples:

- Development and exacerbation of mental disorders (for example: difficulties with executive functions contribute to rumination observed as part of depression).^{41,42}
- Difficulties with emotional regulation.^{38,42}



FUNCTIONAL SPHERE

- **Academic achievement:** poorer academic performance and lower levels of education.⁴³
- **Employment:** lower proportion of people with full-time jobs, lower wages in general, more work absences, more layoffs and job changes. Impairments in attention and executive functions have been associated with a greater need for support at work and more frequent use of specialized help to find work.^{43,44,45}

TREATMENT OF NEUROPSYCHOLOGICAL DIFFICULTIES

A well-rounded **treatment plan** with a qualified professional:

- Can improve the ability to understand other people's feelings and emotions and the ability to feel pleasure.⁴⁰
- Is associated with increased self-esteem, as demonstrated in a study involving people with schizophrenia who received cognitive remediation therapy.^{40,46}
- Foster vocational integration.⁴⁷



Keep in Mind

- All of this points to the fact that it is just as **important to treat** neuropsychological impairments as it is to treat physical or psychological difficulties. Cognitive remediation therapy and pharmacotherapy are two potential avenues for treatment. **Early intervention** promotes development and quality of life. It is also important to focus on **developing protective factors** to promote good neuropsychological functioning.

The Brain: a Modelling Clay?

Stressful situations can change brain functioning. Fortunately, there are strategies that can help people with neuropsychological difficulties function well in everyday life.

- The brain can reorganize and create new connections to reduce the negative impact of neuropsychological difficulties. This is called **brain plasticity**.⁴⁸
- The brain is a bit like modeling clay. It is able to change based on experiences to help the person function better.

There are various ways to maximize brain plasticity, including a treatment approach called cognitive remediation therapy.

- This treatment is a form of cognitive training that uses exercises and different strategies to improve cognitive functions.⁴⁹
- The difficulty of the exercises gradually increases over the course of the therapy.
- It also aims to apply the strategies learned in therapy to daily life to improve brain function.⁴⁷
- **Cognitive remediation** provides a toolkit of cognitive strategies to improve information processing. Some of the strategies are included in the clinical booklets of this toolkit.
- Qualified professionals can offer personalized cognitive remediation treatment.



Resources

When certain difficulties become too overwhelming or interfere with daily functioning, a qualified professional needs to be consulted. This section lists useful resources.

Family physician

Psychologist or neuropsychologist:

Professional qualified in the assessment and treatment of affective and neuropsychological difficulties.

Speech therapist:

Professional qualified in the assessment and treatment of language difficulties or disorders.

Psychoeducator:

Professional who works with people with behavioural adjustment problems in their various environments.

Social worker:

Professional who helps people and communities experiencing problems associated with difficult, crisis or day-to-day situations.

Remedial teacher:

Professional who assesses and intervenes with people who may have learning difficulties.

Associations or community organizations in your local area:

Various services that can be offered for you or your loved ones.

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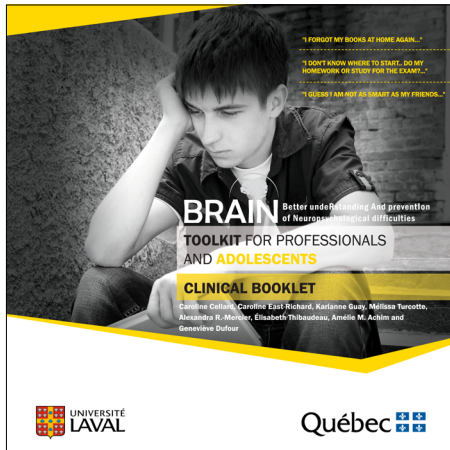
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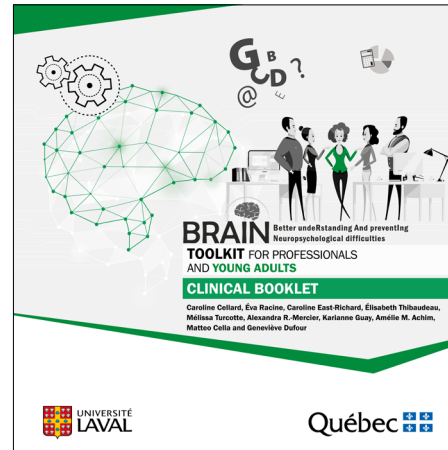
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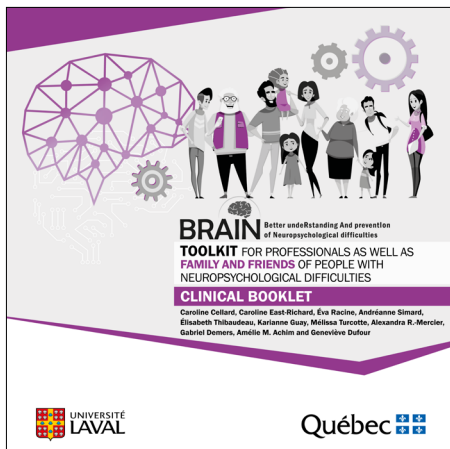
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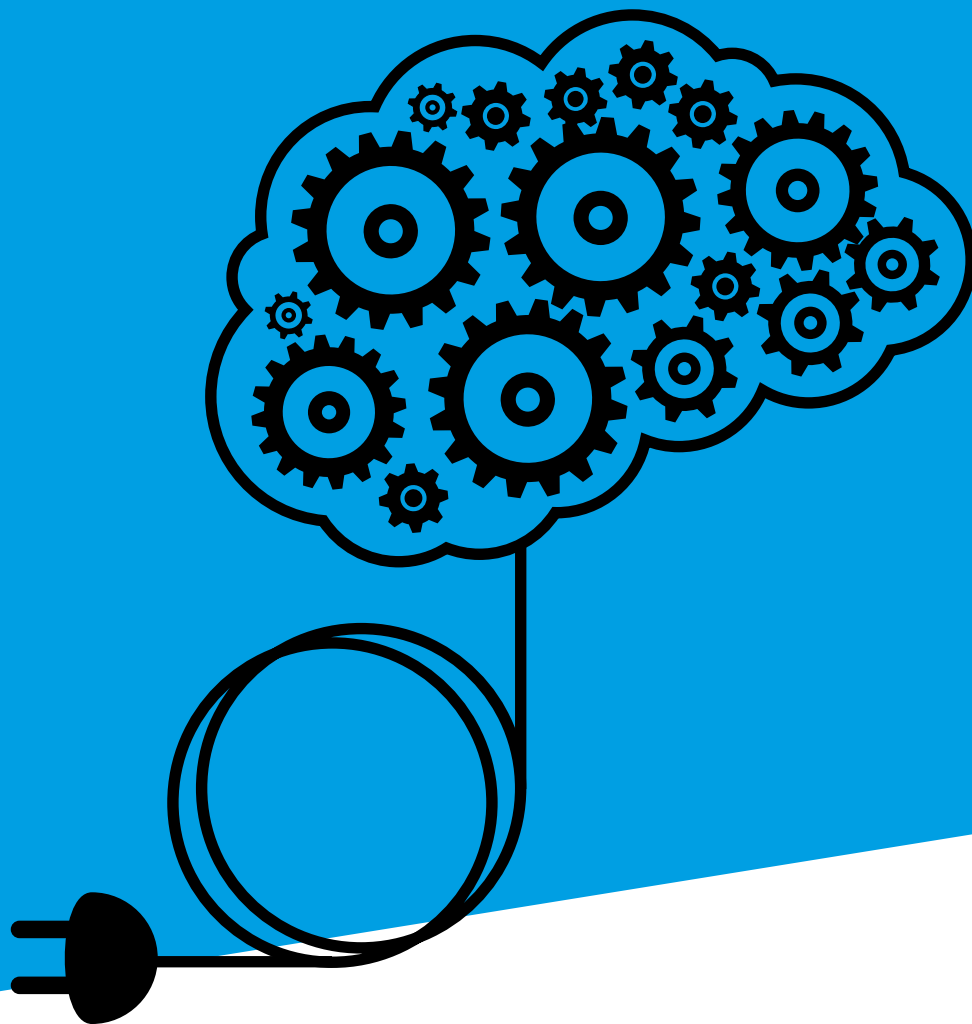


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