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INFORMATION/EDUCATION PAGE

Cognitive Impairment After Stroke: Rehabilitation Strategies and SMART Goal Setting

Target audience: Persons at risk for, or who have experienced, poststroke cognitive impairment.

How does stroke affect thinking skills post-stroke?

- A **stroke** occurs when there is a disruption of blood supply to the brain, leading to the death or damage of brain cells. There are 2 main types of **stroke: ischemic and hemorrhagic**. Ischemic strokes occur when a blood clot in a vessel blocks the blood flow to the brain. Hemorrhagic strokes occur when an artery ruptures, causing bleeding into the brain.
- **Cognition** is the comprehensive term for thinking processes related to recognizing, understanding, and problem-solving. **Cognitive impairment** is a condition that affects various processes, such as thinking, memory, concentration, and decision-making abilities.[1] A stroke can affect various cognitive skills, such as **memory, visual processing, reasoning, recognition, comprehension**, and the ability to formulate thoughts and produce spontaneous speech.
- Each area of the brain is responsible for a different aspect of cognitive function. The area of your brain that is affected by the stroke determines what symptoms of cognitive impairment you may experience. For instance, a stroke in the frontal lobe of the brain may lead to challenges in reasoning, decision-making, and learning new skills.

What is poststroke cognitive impairment?[2]

- Poststroke cognitive impairment (PSCI) affects various mental processes, including thinking, memory, concentration, and decision-making abilities. Although PSCI encompasses a range of cognitive impairment symptoms, they are typically not severe enough to qualify as dementia. Approximately 30% of stroke survivors are diagnosed with PSCI. Risk factors for developing PSCI include being aged >65 years, having high blood pressure, diabetes, atrial fibrillation, and smoking.

Poststroke cognitive impairment and dementia

- Some individuals may experience poststroke cognitive impairment and dementia (PSCID).[3] Approximately 30% of stroke survivors develop dementia (PSCID) within 1 year. Although PSCI and PSCID are related conditions that can occur after a stroke, PSCID represents a more advanced stage of cognitive decline than typically associated with the stroke itself. Early intervention, rehabilitation, and lifestyle management strategies are essential for addressing the different levels of cognitive impairment in both PSCI and PSCID.

What are some cognitive changes you may experience with PSCI?[1]

Table 1 Examples of cognitive changes poststroke.

Orientation difficulties	Difficulty remembering the date, month, year, or the people and places around you.
Awareness	Difficulty realizing you have some cognitive issues, leading to a lack of awareness or forgetfulness. This may also include being unaware of or denying having a disability or impairment such as unawareness of having significant weakness or paralysis on one side of the body and its limitation or believing they can move that side normally.
Attention difficulties	Experiencing difficulty focusing on a recipe while cooking or on lights while driving.
Short-term or long-term memory difficulties	Difficulty remembering important information, such as conversations, medication schedules, and birthdays.
Organizing and planning difficulties	Struggling to efficiently organize mail or plan an event.
Unilateral neglect	While getting dressed, you may forget to attend to body parts or check for glasses placed on the affected side.

What is neuroplasticity? How does it affect my cognitive recovery?

- After a stroke, the brain can still recover to some extent due to "neuroplasticity." **Neuroplasticity** is a process that enhances connections between intact brain cells. Think of brain reserve as the "hardware" of our brain. This reserve is influenced by factors such as brain size and number of neurons before a stroke.
- On the other hand, cognitive reserve is like the "software" of your brain. It is determined by a variety of complex mental and intellectual activities that you engage in throughout your life. Both the brain and cognitive reserves can compensate for the damage caused by a stroke.

Why is cognitive rehabilitation important in my recovery?

- **Cognitive rehabilitation** is a type of therapy that aims to improve cognitive functions such as attention (eg, selective attention and sustained attention), memory (eg, working memory and short-term), executive functions (eg, planning, problem-solving, and decision-making), and language (eg, understanding spoken or written language, conveying language, and social skills). The primary goal of this therapy is to assist individuals with specific cognitive difficulties in enhancing their participation in daily activities, such as managing their medication, using the telephone to call someone, taking public transport, and handling their finances. Regular practice of cognitive exercises enhances memory and thinking skills for better daily life functioning.
- If you require cognitive rehabilitation, it is recommended that you collaborate with a psychologist/neuropsychologist, speech and language therapist, occupational therapist, or physiotherapist. These professionals will assist you in identifying specific problem areas and developing a treatment plan tailored to your needs.
- Collaborating with your family and health care team, you can establish personalized goals and implement cognitive rehabilitation strategies at home.

What are some rehabilitation strategies that I can do at home?[4]

There are many types of cognitive exercises and strategies that you can do on your own at home or in the community outside of your formal

Table 2 Rehabilitation strategies I can do at home.

Cognitive Changes	Rehabilitation Strategies
Orientation difficulties	• Use a daily planner to remember your appointment dates. Read newspapers or listen to the news to keep up-to-date with events.
Awareness	• Video record yourself doing a task such as making a meal, putting away the dishwasher, or completing your morning self-care routine and view it later to see how you perform. • Get feedback from family, friends, and clinicians on how you perform a task.
Attention difficulties	• Engage in activities such as solving block designs, puzzles, crosswords, or sudoku. • Identify visual differences between pictures. • When working on demanding activities such as paying bills, reading a book, or cooking, it is important to minimize distractions in the environment.
Short-term or long-term memory difficulties	• Play memory games such as matching pictures (https://matchthememory.com/) • Learn a new skill or a new recipe. • Set an alarm on your phone to remind you to take your medications on time. • Rehearse or repeat new information provided to you.
Organizing and planning difficulties	• Create a to-do list of everyday tasks. • Create a list of the things you need before you go grocery shopping. • Lay out your clothes the night before to help you get ready in the morning. • Always keep your keys and phone in the same place.
Unilateral neglect	• Place grooming items such as comb, toiletries on the affected side. • Ask your family and friends to talk from your affected side. • Stick a piece of red tape on the affected side of the kitchen counter to increase attention to that side. • Use your finger to follow through the entire sentence while reading a book.

therapy sessions with a health care provider. Table 2 provides you with some ideas of what cognitive skills you may want to work on.

What are some cognitive rehabilitation interventions I can do with my therapist?[4]

Rehabilitation strategies can be performed at home with the assistance of family members or independently. However, you can also seek support from your health care team to optimize your progress. Some of the topics discussed in this section can be carried out with the help of your therapist (table 3).[5-8] Moreover, you can engage in some of these activities outside your therapy sessions to further enhance your cognitive abilities.

How can I maximize my cognitive rehabilitation through SMART goals?

Setting goals is essential to cognitive rehabilitation as it can lead to greater satisfaction, motivation, recovery, and meaningful outcomes.[9] Creating personal goals is an effective way to

Table 3 Rehabilitation strategies from health care providers.

Rehabilitation Intervention	Purpose of the Intervention
Remediation[5] (correction)	*Improve cognitive function by identifying people, places, time, and situations in the environment* • After a stroke, you may experience confusion regarding time, date, and familiarity with places. • Your therapist may improve these skills by asking you to repeat or write down dates, months, years, times, and locations.
Strategy training[5]	*Thinking skills with the help of tools or strategies* • A strategy is a helpful tool used to complete daily activities. • Your therapist may notice that you tend to ignore items on your left side of vision. Your therapist will instruct you to turn your head to the left when looking at items located on the left side.
Virtual reality[6]	*Games can improve cognitive skills by allowing interaction with computer-simulated environments through technology* • Your therapist may recommend using virtual games like Lumosity for education and training. • Engaging in virtual games can enhance various cognitive skills, including attention, memory, and problem-solving.
Functional cognition[5]	*Cognitive skills apply to everyday activities* For example, you use cognitive skills sequencing, motor coordination, attention, and memory to complete a dressing activity. • Your therapist may train you to use checklists to remember all the steps needed to complete the dressing activity successfully.
Dual tasking[7]	*Carrying out 2 or more complex tasks at the same time can improve your performance during activities of daily living* • In everyday life, you may be required to think and reason while carrying out certain tasks at the same time. • For example, your therapist may ask you to recall the order of wearing clothes while you are buttoning your shirt.
Noninvasive brain stimulation (NIBS)[8]	*NIBS may promote cognitive functions* such as *attention and working memory* • Your therapist will place electrodes over your head to stimulate your brain to improve your ability to learn skills, improve your planning abilities, and to enhance your memory.

prioritize what matters most and bring about positive change in your daily routine.

- The SMART goal framework is a common guide that helps you set an effective goal. You can set goals at home, independently, or with the help of a family member and/or health care provider. Your goals should be: **S**pecific to you and your needs, **M**easurable; **A**ttainable; **R**elevant to you; and have a **T**imeframe. Figure 1 provides an example of goal setting.
- It is recommended that the goals you set should be agreed on by you, your family, and health care team.

What other strategies can help my cognitive recovery?

Complementary and integrative medicine

Cognitive recovery can involve complementary and integrative medicine practices such as yoga, mindfulness, and meditation.

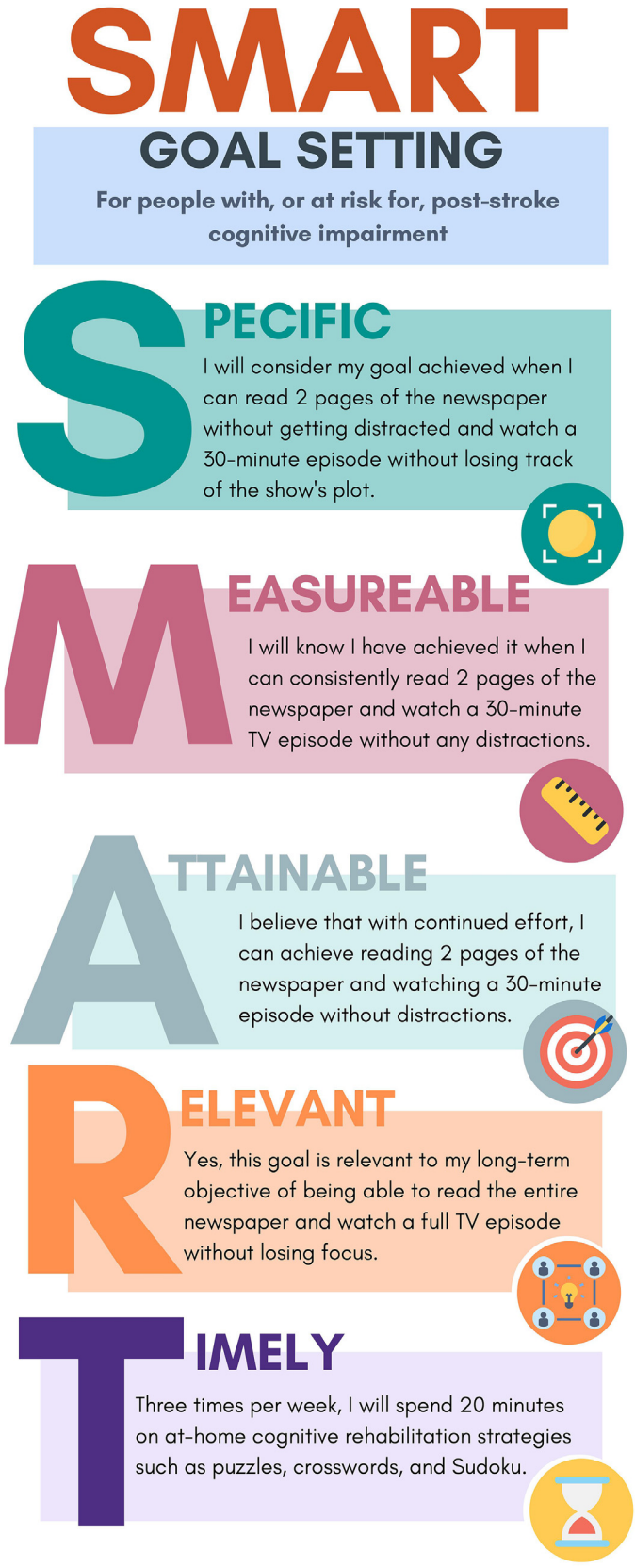

Fig 1 Goal setting using SMART goal framework.

Table 4 Resources on cognition poststroke

Resource Organizations	What It Offers	Websites
Resources in English		
Stroke Engine	Cognitive rehabilitation	https://strokengine.ca/en/interventions/cognitive-rehabilitation/
Stroke Association UK	Problems with memory and thinking	https://www.stroke.org.uk/effects-of-stroke/memory-and-thinking
Stroke Alliance for Europe	18 Ways to Improve Cognitive Problems After Stroke	https://www.safestroke.eu/2019/08/21/18-ways-to-improve-cognitive-problems-after-stroke/
American Stroke Association	Common Communication and Cognitive Changes After Stroke	https://www.stroke.org/en/life-after-stroke/life-after-stroke-guide/communication-and-cognitive-changes
Heart and Stroke Foundation of Canada	Vascular cognitive impairment	https://www.heartandstroke.ca/stroke/what-is-stroke/vascular-cognitive-impairment
Resources in French		
Stroke Engine	Réadaptation cognitive	https://strokengine.ca/fr/interventions/readaptation-cognitive/
Resources in Spanish		
Mayo Clinic	Rehabilitación de accidente cerebrovascular [Spanish]:	https://www.mayoclinic.org/es/diseases-conditions/stroke/in-depth/stroke-rehabilitation/art-20045172
American Stroke Association	La vida tras un ataque cerebral: nuestro camino hacia delante	https://www.stroke.org/-/media/Stroke-Files/Spanish-Resources/Life-After-Stroke-Guide_SpanishA.pdf

- **Yoga** practice teaches self-control and discipline and allows mind and body to work together.[10]
- **Mindfulness** is the state of being fully present in the moment and being aware of your thoughts, emotions, and sensations. Practicing mindfulness can enhance attention span and performance in demanding cognitive tasks.[11]
- **Meditation** aids in training attention and awareness, contributing to the cognitive recovery process. Additionally, meditation helps reduce symptoms of depression, tiredness, and fatigue. You can practice meditation on your own using various meditation applications, such as Calm, Headspace, Unplug, and Buddhify.

Applications for Brain Training

Some applications can be helpful for training memory and attention, as well as challenging your reasoning skills.[12] Here are some examples available on Android or iOS: Peak (PopReach Incorporated), Neuronation (NeuroNation), Train your Brain (Senior Games), Impulse - Brain Training (GMRD Apps Limited), Brainwell Mind & Brain Trainer (Monclarity, LLC), and Lumosity (Lumos Labs, Inc).

To learn more about cognition poststroke, you can find additional resources in table 4.

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