

The Rehabilitation of Perceptual & Cognitive Deficits Post Stroke

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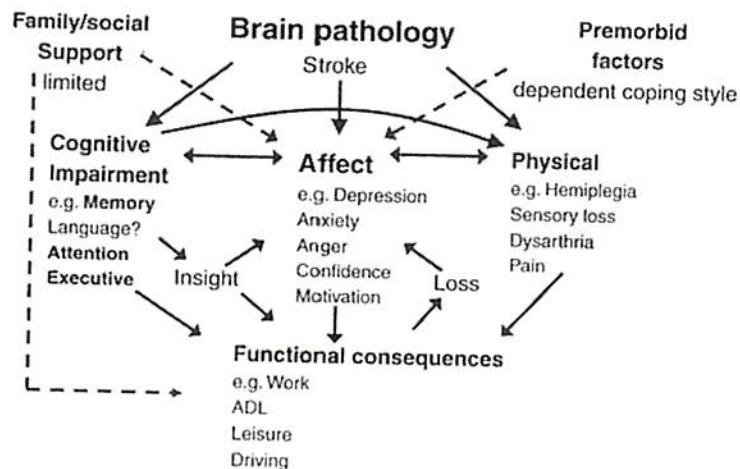
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Objectives:

- Describe common cognitive and perceptual deficits following a stroke
- Predict potential functional impact related to these deficits
- Identify common cognitive and perceptual screening tools and assessments used with this population
- Add best practice rehabilitation exercises to use with your stroke patients

A Stroke affects the Brain Potentially Causing Deficits in

- Physical
- Cognitive/Perceptual
- Communication
- Mood
- Personality
- Behaviour



Reasons we care about cognitive impairment in stroke patients

- 2/3 or 66% of stroke patients experience cognitive impairment
- Cognitive impairment is an important predictor of functional outcome
- Cognitive impairments are often the most persistent results of brain injury in people with good to moderately good neurological recovery

Reasons we care about cognitive impairment in stroke patients

- Greater mortality one year post-stroke for those stroke patients with cognitive impairment

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- Stroke-related cognitive can be permanent and progressive
- Post-stroke cognitive impairment is associated with ↑ risk of dementia – new estimates are as high as 25% of post-stroke patients with cognitive impairment demonstrate a dementia 3-months after their stroke
- ↓ percentage of stroke patients return home when cognitive impairment is present

Cognitive impairment is associated with

- ↓ ADLs
- ↓ IADLs
- ↑ length of hospital stay
- ↓ number of stroke patients returning home

Most Prevalent Cognitive Deficits with Stroke Patients

☐ Global

- ☐ Attention
- ☐ Executive functioning
- ☐ Speed of thinking

☐ Focal stroke-related deficits

- Unilateral inattention
- Language/communication – aphasia

Stroke and Cognitive Rehabilitation

- 16% - 20% of stroke patients with cognitive impairment improve
- Cognitive rehabilitation interventions are associated with small but significant treatment effects
- Biggest improvements found with attention
- Least improvements found in memory

Rehabilitation Approaches

the remedial or restorative approach: remedial strategies are designed to repair processes and restructure or rebuild damaged neural networks e.g., unilateral inattention

the adaptive or compensatory approach: compensatory strategies focus on adaptive behaviours e.g., attention, memory

The toughest challenge in rehabilitation is the issue of generalizability

Acute, Rehabilitation, Community

Acute - Screening & general identification of possible cognitive impairments

Rehabilitation – Multidisciplinary assessment and treatment development and implementation

- Facilitating recovery
- Individual and family education
- Shift to determining the longer term problems

Community – Treatment shifts to the use of compensatory strategies to minimize negative effects of stroke-related deficits

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Cognition is defined as the process of knowing and refers to how we think and how we know things

- Attention
- Memory
- Perception (visual spatial processing, unilateral inattention, praxis)
- Communication/Speech/Language
- Executive functioning (insight, problem solving, judgment, planning)

Cognition/Perception – Specific Abilities

1) Attention

- Attention is a basic cognitive ability required for all other cognitive processes
- Attention is the gateway for information to flow into the brain

Different aspects of Attention

Sohlberg & Mateer's Model (1987)

- **Focused attention** – the ability to register/recognize sensory info
- **Sustained attention** – the ability to maintain attention over time during a continuous and repetitive activity
- **Selective attention** – the ability to process target info selectively and inhibit responding to non-target info
- **Alternating attention** – the ability to shift one's focus between tasks that demand different skills
- **Divided attention** – the ability to respond to two or more events or stimuli simultaneously

Attention allows a person to filter relevant from irrelevant information; hold and manipulate mental representations; monitor responses to stimuli

Attention is multi-modal – e.g., language-based (letters/numbers), visual (circles, squares), spatial (locations of things) or auditory (tones)

What you may see....

- Making careless errors
- Easily distractible
- Trouble attending to a single task over time
- Unable to walk and talk at the same time
- Miss detail – in conversation, when reading
- May appear impulsive
- Occasionally may present with agitation

Attention Strategies - Compensatory Approaches

- Reduce environmental distractions – turn off the tv or radio; reduce interruptions; move to a quieter room
- Use short, simple step-by-step instructions
- Use prompts e.g., people's names, make eye contact, touch
- Slow down – leave more time between instructions & response, between turn-taking in conversation
- Use shorter therapy sessions
- Prompt the person to be aware for the need to pay attention
- Address fatigue/be well rested

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Attention - Compensatory Approach

Time Pressure Management

Winkens et al (2009)

- Targets mental slowness
- People are trained to apply a structured problem-solving strategy to assist them in controlling info input
- Trains people to make effective decisions before and during a task

Steps

- Initially target easy tasks
- Start with modeling then person uses overt self-talk
- Remind people importance of using the strategy to avoid problems
- Use brief learning trials spread over a long period

Attention - Compensatory Approach

***n*-back Working Memory Task**

Cicerone (2002)

- Uses a deck of playing cards
- Consists of the presentation of a sequence of cards with the requirement that the person continuously report the stimulus occurring *n* number of cards previously
- Done in 1 hour individual sessions with 20-30 minutes devoted to feedback, review factors which influenced performance, development of helpful strategies, bridging with examples of daily life attentional problems

Evidence says...

- Attention training is most effective when using complex tasks requiring selective or divided attention
- Training should involve different stimulus modalities and response demands
- Therapist activities should include monitoring patients' performance, providing feedback and teaching strategies
- Improvements from non-timed tasks therapy appear to be more effective than timed tasks
- Attention training during acute recovery is not recommended
- Compensatory strategies are best for attentional problems
- There is limited evidence for computer-assisted attention training at this time
- There is limited evidence of improvement in everyday functional activities after attention training

2) Unilateral Inattention

A **perceptual and attention** impairment involving decreased awareness of the body and environment on the side affected by the stroke.

(Also called: hemi-neglect, hemi-inattention, unilateral neglect, hemi-spatial neglect, visuo-spatial neglect, hemi-imperception)

Major factor interfering with rehabilitation outcomes The presence beyond the acute stage is associated with poor independence outcomes and thus rehabilitation is greatly focused on this deficit

- Most common with right hemisphere lesion
- May exist with or without hemianopsia
- Varies in severity and type of symptoms seen
- Patients are frequently unaware of and indifferent to their inattention

What you may see...

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- Bumping into (or walking too close to) things on the affected side
- Not responding when you talk to them on the affected side
- Become startled when you approach from the affected side
- Head always positioned away from affected side
- Awkward positioning of the limbs on the affected side
- Missing items on food tray, sink, etc. on the affected side
- Only performing ADLs on unaffected side
- Can't make sense of what they are trying to read, the clock, etc.
- **alien limb syndrome** a person talks about their affected limb as if it doesn't belong to them and push it away from their body

Unilateral Inattention Strategies

Remedial Approach

- **Awareness training** (anticipation/prediction of performance, allow time for self-discovery of errors, provide immediate feedback, assist with self-evaluation, teach self-cueing: "am I looking all the way to the left?")
- **a) Visual scanning**
- **b) Limb activation**
- **c) Visuo-spatio-motor cueing**
- **d) Mental imagery**
- **Visual, auditory, tactile cueing**

Compensatory Approach

Body positioning (head or trunk rotated to the left); assist with safe positioning of the left upper extremity

Task Positioning (stimulus place to the right)

Environmental adaptation (accommodate for deficit by placing important items on the right)

Other treatment techniques: vestibular stimulation, eye patching/forced use, prisms, generalized sustained attention

a) Visual Scanning Training - Remedial Approach

- Use of anchoring
- Training people to look to the left
- With or without real motor activity of the left arm or hand
- Primarily uses visual cancellation tasks, can also rely on line crossing and line bisection tasks

Cancellation Tasks Diller et al (1980)

- **Anchoring** Verbal or visual cues to begin each line at the extreme left side of the page works
- **Pacing** To prevent drift & ↓ performance, recite the targets aloud. This slows and evens out the speed of doing the task
- ↓ errors by ↑ distance between targets

b) Limb Activation - Remedial Approach

- People are taught to move or simply attend to the affected limb prior to or during a spatial activity
- Based on research that neglect/inattention is a lateralized attention deficit
- Motor responses on the opposite side to the lesion ↑ activation of the damaged hemisphere, causing a change in lateralized attention

c) Visuo-spatio-motor Cueing - Remedial Approach

- Combines visual scanning and limb activation strategies
- The most helpful movements are those that visually cue the person to the left side while activating the left limb at the same time
- People can be trained to move their left arm and to look at it when they are unable to find the target of an exercise

Possible activities to use in training

- Shapes, number or letter cancellation tasks using a boundary line as well as the hand as a visual anchor
- Reading materials using a boundary line as well as the hand as a visual anchor
- Locating keys on a computer
- Paper and pencil tasks – drawing, copying, colouring, writing
- ADLs – grooming, eating, dressing
- Cooking
- Functional physical activities – transfers, ambulation, wheelchair/walker negotiation
- Scanning for specific road signs when a car passenger

d) Visual Imagery Training - Remedial Approach

Lighthouse Strategy Neimeier (1998), Neimeier et al (2001)

- Teaches people to use the imagery of being a lighthouse, turning from side to side in order to illuminate their surroundings
- Moves from paper-and-pencil tasks to real world functional tasks

3) Visual Spatial Processing

The ability to appreciate the spatial relationships of objects in relation to oneself and the relationships between objects in space. Includes:

- Spatial Relations
- Visual Discrimination
- Figure Ground
- Visual closure
- Visual Memory

Spatial Relations: the ability to orient one's body in space and to perceive the positions of objects in relation to oneself and to other objects

Visual Discrimination: the ability to discriminate dominant features in different objects (such as position, shapes, and colours)

Figure Ground: the ability to distinguish an object from its background

Visual Closure: the ability to identify incomplete figures when only fragments are presented

Visual Memory: the ability to recall dominant features of an item or to remember the sequence of several items

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What you may see....

- Misjudging movements (e.g. over- or under-reaching or stepping)
- Difficulty finding objects (e.g. items on their meal tray, ADL equipment, specific clothes in closet)
- Difficulty applying brakes on wheelchair or walker
- Difficulty remembering a visual scene (e.g. who was in the room during the doctor's visit, what was on their meal tray)

Visual Spatial Processing Strategies

- Practice of a particular skill improves performance of similar perceptual tasks. This should involve both tabletop tasks and functional tasks.
- Reduce the amount of "visual noise"
- Increase contrast

4) Executive Functioning

Are abilities that enable a person to successfully engage in independent, self-directed, purposeful behaviour

Are abilities that help people transfer past success to present and future situations

Executive Functioning includes such abilities as:

- reasoning/decision making
 - one's awareness of oneself/insight
 - self-monitoring (such as noticing if you are making errors while doing a task)
 - self-regulation (behaviour, emotions)
 - switching tasks
 - planning
 - organizing
 - judgment
 - initiating or getting started with doing things
- ▶ **Insight:** the degree to which you can realistically evaluate your situation. Someone with damaged insight will often be unaware of the mistakes they make or be indifferent because they are unable to understand their importance
- ▶ **anosognosia** – a loss of ability to recognize or to acknowledge an illness, bodily defect or functional problem
- usually associated with right parietal or frontal damage

What you may see....

- Risky behaviours - Unsafe transfers, not using ambulation aids, walking in sock feet, eating too fast
- Impulsivity
- Social disinhibition, interpersonal conflict
- Poor initiation
- ↓ ability to problem solve or generate solutions
- Impaired judgment
- Unrealistic judgment of present abilities

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Metacognitive Strategy Training

- Deals with training of strategies to improve a person's awareness of their own thinking processes
- Focuses on self-monitoring and self-regulation tasks
- Therapist activities should include monitoring patients' performance, providing feedback and teaching strategies

Goal Management Training

- A type of Metacognitive Strategy Training
- Following written directions, think about the end goal, go step-by-step, check off each completed step
- People learn to be better at being clear what it is they are trying to achieve, keeping in mind the steps needed to achieve the goal, and then regularly checking to make sure important tasks are attended to
- Talking through the different steps of tasks, assisting with self-monitoring by regularly double-checking your work, and reviewing instructions and information needed to perform tasks with a trusted other person can improve your problem solving skills.

Evidence says

- There is little evidence regarding remediation of executive functioning and problem-solving post-stroke
- Evidence for effectiveness with ABI

5) Memory

The ability to retain and recall new information

Episodic Memory: remembering past events and activities

Prospective Memory: remembering to do things in the future

Procedural Memory: learned motor, cognitive and language processes

Stages of Memory

encoding: taking in of information

storage: retaining the information

retrieval: accessing the information when it is required

What you may see...

- Patients repeating themselves in conversation
- Forgetting what someone has said
- Not remembering what they did yesterday
- Forgetting appointments
- Misplacing commonly needed objects like one's keys or glasses
- Forgetting people's names
- Forgetting to eat
- Forgetting to shut off water/turn off stove

Memory Strategies - Compensatory Approaches

- Follow a set routine
- Use external aids such as an agenda book, bulletin or white board, calendar
- Use note-taking and list making
- Keep regularly used items in a set place
- Use labels, sticky notes

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Memory Strategies - Compensatory Approaches

- Use alarm clocks, timers
- Blister packed medications or dosettes
- Electronic organizers e.g., Smart phones

Memory strategies which enhance encoding

- spaced repetition (repeating information in increasingly longer intervals),
- meaningfulness (making incoming information meaningful by visual, semantic or other means)
- "see it and say it" strategy (attending to important incoming information) For instance when locking the door or turning the stove on or off. This technique reduces forgetting due to being on "autopilot" and not attending to environmental information.

Strong evidence that compensatory strategies are effective in improving memory functioning (although most research has been with ABI populations and little research for stroke)

6) Apraxia

Apraxia: An inability to plan and perform familiar purposeful movements in the presence of intact motor control, coordination, sensation, and comprehension.

(Also referred to as dyspraxia or motor planning impairment).

Primarily Includes:

- ▶ **Ideomotor:** difficulty carrying out a movement or task to command or imitation but can perform the movement/task spontaneously. (Constructional disorder)
- ▶ **Ideational:** difficulty carrying out the steps of a task in the correct sequence or at all AND inability to manipulate common objects correctly. (Conceptual disorder)

What you may see....

- Unable to follow instructions or seems to be ignoring directions (especially complex, or multi-step verbal directions)
- Difficulty performing ADLS (may be unable to initiate, follow correct sequence, terminate movement, or use appropriate tools)
- Repetition of movements (motor perseveration)
- Difficulty moving lips/tongue/mouth to form words

Apraxia Strategies

Ideomotor:

- keep instructions simple
- Use familiar routine & environment
- Hand-over-hand guidance
- Chaining techniques (YOU begin movement and patient continues and follows through)
- Visualize the task/movement before performing
- Ask the patient to verbalize steps
- Break the activity into smaller parts and try each part separately.

Ideational:

- Use familiar routine & environment
- Frequent practice using objects appropriately (errorless learning)
- Break the activity down into smaller parts and guide through each step
- Make a simple checklist or pictures to demonstrate the sequence of the task so the patient can refer to in when performing the task.
- Avoid giving the patient complex adaptive devices (such as a reacher).

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Take Home Message

- ✓ Cognitive & perceptual deficits are common and disabling post stroke
- ✓ Stroke recovery is a variable process
- ✓ Screening helps track impairment & recovery
- ✓ Assessment helps define in more detail
- ✓ Stroke rehabilitation should take into account the entire person and their context for the most effectiveness
- ✓ The issue of generalizability is a tough challenge for rehabilitation

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Resources

www.strokebestpractices.ca
www.canadianstrokenetwork.ca
www.heartandstroke.ca
www.ontariostrokenetwork.ca
www.strokengine.ca
www.stroke.org (National Stroke Association [American])
www.ebrsr.com (Evidence Based Review of Stroke Rehabilitation [Canadian])

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Includes an excellent discussion of how to conduct the therapy.

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