Thinking about Thinking

A Team Approach to Assessment and Treatment of Post Stroke Cognitive Impairment

Developed and Presented by Sherree Robinson
Occupational Therapy Manager- Rankin Park Centre  Phone: 49214897
Cognition

Cognition is the ability of the brain to **process, store, retrieve and manipulate information**. This involves, planning, organisation, initiation, memory, problem solving, orientation, mental flexibility, abstraction and attention.

These factors have an impact on the way the person relates and understands their environment and their capacity to take on new learning.

Cognitive deficits impact upon every aspect of life and can create difficulties in all areas of occupational functioning.

Cognition can be categorised into three components:

1) **Primary cognitive capacities** (orientation, memory and attention),

   The primary cognitive processes are thought to be prerequisites to higher level thinking abilities.

2) **Higher level thinking abilities** (reasoning, concept formation and problem solving)

3) **Executive functions and self awareness.**

   Executive functioning includes planning, decision making, directed goal selection, self-inhibiting, self-monitoring, self-evaluation, flexible problem solving, initiation and self-awareness /insight. Intact executive functions are necessary for the successful performance of unstructured multi-step occupational tasks and roles.

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Prevalence and Impact

Statistics indicate that approximately 45% of stroke patients have cognitive impairment on admission and 35%–43% continue to have cognitive impairments 3 months post stroke.

Research has shown that cognitive impairment in stroke patients is associated with adverse effects on the rehabilitative outcomes. Tatemichi et al’s research found overall functional impairment was greater with cognitive impairment, and dependent living after discharge either at home or nursing home was more likely (55.0% with, v 32.7% without cognitive impairment, p = 0.001). In a logistic model examining the risks related to dependent living after stroke, cognitive impairment was a significant independent factor.

Cognitive domains most likely to be defective in stroke compared with control subjects were memory, orientation, language, and attention. Among patients with stroke, cognitive impairment was most frequently associated with major cortical syndromes and with infarctions in the left anterior and posterior cerebral artery territories.
A study by Galski etal (1993) revealed the primary importance of higher-order cognitive impairments (comprehension, judgment, short-term verbal memory, and abstract thinking) in extending length of stay and increasing referrals for outpatient therapies and home services after discharge for the cerebrovascular accident patients in comparison with orthopedic cohorts.

The presence of cognitive impairment in patients with stroke has important functional consequences, independent of the effects of physical impairment.

There was an association between poststroke depression and cognitive impairment; the domains most likely to be defective in stroke-related depression were memory, nonverbal problem solving, and attention and psychomotor speed.

A bottom up approach to assessment and treatment is based on the premise that underlying performance components are the key to successful occupational performance. Assessment and treatment of the underlying impairments will lead to correction of occupational performance.

A top down approach assumes a focus on the occupational role and assessment and treatment is based on participation in functional tasks.

Assessment of Cognition

**Standardised Assessments** (Bottom up approach)

The NSF Clinical Guidelines highlight a *GOOD PRACTICE POINT* that all patients should be screened for cognitive deficits by reliable and valid screening tools.

A comprehensive cognitive assessment should assess arousal, attention, distractibility, memory (immediate and delay recall of auditory and visual information), orientation (person, place, time) insight, problem solving, sequencing, reasoning, ability to follow instructions, initiation, planning and organisation.
Advantages of Standardised Assessments

Standardised assessments are designed to be valid and reliable and therefore objective.

They should be responsive enough to detect important changes.

They allows the therapist to rate performance against aged appropriate normative data.

Can be repeated to show progress over time and be used as an outcome measure,

Quantifies performance and therefore highly valuable for medico-legal reports due to normative data and objectivity.
Disadvantages of Standardised Assessments

They can be non contextual and non – functional and may not reflect actual functional ability.

In my experience, there is no one assessment battery available that will comprehensively assess all domains of cognition well. You need to use a few different ones to get a comprehensive picture.

Patient may not perform as well as possible due to test anxiety.

Other factors & impairments may impact adversely on the test results, language impairments, visual field deficits, perceptual impairments, pre- morbid literacy and numeracy issues, fatigue, pain or UL impairment ( unable to write).

Many have low ceilings – that is you can score well but still have functional cognitive impairments.

They can be time consuming
Non-standardised Assessments

• Non-standardised screening tools for cognition and perception

• Use of Functional assessment tools – use of FIM (Functional Independence Measure) or Bartel index of ADLs, (Top down approach). PRPP

• Use of observational functional assessments such as self care, meal preparation, laundry, shopping, money management and community access.
A 2011 study by Yantz et al demonstrated that a stroke patients’ performance in a functional cooking task performance correlated with their performance in neuropsychological assessment task. This indicates that assessments of kitchen skills is an valid method of assessing cognition.

A 2009 study by McKye et al reviewed the difference between the Occupational Therapist’s perspective of functional performance at discharge, which is often used to make decisions related to discharge, versus actual performance. The results of the study indicated that the Occupational Therapist’s accuracy of perception of functional performance post discharge was significantly more accurate if that specific ADL task was assessed whilst the patient was an inpatient (82% accurate versus 52% accurate).
• Observation/assessment of the patient completing a functional task offers the best perspective of the patient’s cognitive ability. Furthermore, assessment of the patient completing the task in their usual environment is the best measure of cognitive performance, highlighting the importance of home assessments, workplace assessment and community access assessments. Everyone’s home is different and offers different challenges but is also comfortable, familiar and real for the patient.
More on Functional Assessments

- Assessment of the patient completing ADL tasks provides an opportunity to assess the patient completing a real task in an appropriate context. Observing a patient making a cup of tea, which can take less than 10 minutes can assess planning, task organisation, sequencing, attention, problem solving, memory, initiation and safety awareness.

- Having a chat afterwards about how they felt they performed and reflecting on what aspects they felt were easy or difficult can give you a good picture of their insight.
The whole team is needed to complete the whole picture

- All members of the team can gain a perception of cognitive impairments through simply observing task performance in whatever it is they are doing with the patient. Do they recall the location of the gym, can they remember their exercise, did they organise everything they needed to bring to the SP session, did they initiate the task without prompting.
- All tasks have cognitive components therefore there is an opportunity at every moment to assess cognition.
- These incidental observations from all team members are the puzzle pieces required to complete the whole picture.
What is Functional Cognition?

- In assessing cognitive impairments, deficits should be considered in relation to the required cognitive demands of the patients. Functional Cognition is different for each patient.

- Tom is 80 years old. He has residual hemiparesis and will be discharged home into care of his wife. She will be completing all domestic tasks and banking tasks. Due to Tom’s large family network, it will be unlikely that Tom will be alone at home for longer than a few minutes. On a cognitive test, Tom presents with mild memory problems and difficulty with simple calculations, abstract reasoning and had difficulty sequencing the order for sending a letter. During a functional assessment he could shower and dress himself. During his Home assessment, he could find his way around his home well, make a cup of tea but couldn’t use the stove safely and could dial 000.

- Despite the deficits post stroke, Tom’s cognition is “functional” in that he has adequate cognitive capacity to meet his required cognitive demands.
• Tony is 45 years old and was working as a civil engineer prior to his stroke. His goal is to return to work as soon as possible.

• In cognitive and functional assessments Tony had difficulty with multi tasking with three or more demands, sequencing tasks with greater than 10 steps and complex multi step calculations. His memory function was assessed to be at the lower end of the normal range for age. Based on the cognitive demands of his complex and specialised role, Tony’s cognition is not adequate for returning to work.
Types of Treatment Approaches

Remedial –

“Aims to restore and improve impaired functions by supporting and facilitating the brain’s recovery and plasticity. It assumes a capacity for recovery through such processes as axonal sprouting, synaptic plasticity and reorganisation of function in which undamaged areas of the brain take over functions of the damaged areas”

( Grieve & Gnanasekaren, 2008, pp.42-43)

Treatment aims at improving specific impairments such as memory training, sequencing training.
Adaptive

“Assumption is based on the premise that recovery within the central nervous system is limited. The focus is on using remaining functions and utilising techniques or strategies to overcome difficulties” (Grieve & Gnanasekaren, 2008, pp.42-43). Treatment may involve adaptation of the task, environment or training the individual in new techniques such as diary use, labelling cupboards to indicate location of items etc.

In practice, most OT’s use a combination of both remedial and adaptive approaches with clients with the actual balance dependent on diagnosis, prognosis, recovery to date, success of treatments and the capacity of the client to take on new learning.
Cueing / Prompting:

A process of guiding and directing performance

Prompts should be simple and concise
They can be:

- **Visual** e.g., demonstration, use of a mirror
- **Verbal** – e.g., spoken
- **Written** – e.g., list, sequence sheets
- **Tactile** – e.g., guiding a body part
- **Environmental** – e.g., labeling cupboards, rooms etc

The frequency and how directive the prompts are should be graded to continue to facilitate independence and to minimise the clients reliance on prompts.

Non-directive prompt - “What do you think you should do next”

Directive prompt – “You need to brush your hair”

The use of prompting can be an indicator of improvement in task performance.

Chaining

Chaining is a technique of breaking the task down into steps and teaching each step one by one. Can be either forward chaining or backward chaining.

Forward chaining: the client completes the first step of the task and the clinician completes the rest. Once the client has mastered this step then they move onto completing step one and two and so on.

Backward chaining: the therapist completes all stages of the task except the last one, which the client completes. Then the therapist completes all apart from the last two and so on until the client completes the whole task.

Feedback

- Feedback is used in cognitive and perceptual rehabilitation to highlight improvements, errors and reinforce correct procedures.
- Positive feedback helps to keep the client motivated, goal focused and minimise frustrations.
- Make feedback specific – for example rather than “Well done you did well today”, make it specific for example “I can see a real improvement in your attention today, you stayed focused for the whole 30 minute session”
- Think about the timing the feedback should be given. It may be appropriate throughout the session if the patient is not distracted by it or saved until the end.
- Be conscious of providing too much feedback, especially too much positive feedback as it will make it less meaningful.
- Quantity of feedback should be reduced over time to decrease the possibility of the client becoming dependent on it.
Grading

This is an important tool and allows the therapist to adjust tasks to the individual needs of the client to facilitate improvements.

Grading changes the cognitive demands of the task making it easier or more difficult.

You can grade the task, environment or the nature of therapist input.

How, when and what you grade depends entirely on the needs of the individual.

# Grading

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<th>VARIABLE</th>
<th>TYPE OF GRADING</th>
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| THERAPIST      | Increasing / decreasing amount of prompting  
|                | Changing the type of prompts used  
|                | Change the timing of prompts and feedback  
|                | Change the degree of physical assistance or guidance                                                                                     |
| TASK           | Time taken/duration  
|                | Number of steps or items  
|                | Degree of complexity  
|                | Familiarity  
|                | Adaptive aids used                                                                                                                         |
| ENVIRONMENT    | Familiarity of the environment and tools used  
|                | Number of distractions  
|                | Appropriateness of context                                                                                                                  |
Memory

Memory is a set of interrelated brain processes that allow one to store and retrieve a specific type or class of information.

Learning is the process of acquiring new information, while memory refers to the persistence of learning in a state that can be revealed at a later time.

Memory plays a role in almost all higher cognitive functions. Planning, problem solving, sequencing, reasoning all require our memory to function effectively. Memory consists of three stages:

1) Acquisition - information is received and held in short term memory –
2) Storage / Retention – Information is stored in a more permanent form called long term memory.
3) Recall / Retrieval – the process of accessing stored information.

"Dave. When did you last feed the goldfish?"
Treatment of Memory Deficits

Remedial -
Attempts to restore memory impairment.
Although positive results of memory rehabilitation have been reported in uncontrolled studies, a Cochrane review by Roshan et al. concluded that there was no evidence to support or refute the effectiveness of memory rehabilitation on functional outcomes or measures of memory after stroke. There is a need for more robust, well-designed, and better-reported trials of memory.

The Stroke Guidelines indicate that stroke patients presenting with memory impairment should be taught approaches directly aimed at improving their memory (Good Practice Point).

Adaptive –
Functional or environmental adaptations to compensate for deficits. NSF Clinical Guidelines indicate memory compensation training should be undertaken with patients presenting with memory impairment. (2010).
Remedial Treatment

Focusing on strategies to enhance the capacity to store and retrieve information.

1) Visual Imagery
2) Association – associating information you need with something you already know eg lock codes the same as birthday
3) First letter association – involves an acronym or word being made out of the first letter of the items to be remembered e.g., ROY G BIV – for the colours of the rainbow in order
4) Storytelling – to link items to remember such as shopping lists, to do lists
5) Rhyming – creating a rhyme of material you need to learn eg thirty days as September……
6) Mind Mapping – organising ideas into sections, headings, main words etc
7) Chunking – ideas are placed into categories to assist with recall e.g., phone number in chunks 0424 551 980
8) Repetition or rehearsing – improves retention and recall

Adaptive Treatment

External memory aids

• Must be purposeful and goal orientated
• Should be normal behaviour
• Should be specific to the person
• Will require training for successful use in daily life

• Examples Include: External cues and devises such as calendars, diary, written schedules, checklist, to do lists (shopping lists), Alarms, clocks, electronic devises (mobile phones, digital watch, recording devises, electronic pill boxes, pagers, computers), labelling cupboards etc.

“I forget, is this my cell phone, PDA, iPod, GPS, or iPad?”
Attention and Concentration

The ability to deploy mental resources for purposes of concentration. It is the means by which one can orient in order to receive incoming information. There are various types of attentional demands.

**Arousal**: Level of alertness – sleep/wake cycle. The readiness of the CNS to receive information. Arousal is required for attention.

**Sustained Attention**: Ability to maintain attention for a long time. Involves concentration and focus on a task.

**Selective Attention**: Attending to what is relevant and screening out irrelevant details. The brain is bombarded with information from all over the body and environment, If all was processed it would overload the brains’ capacity. Selective attention allows us to deal with what is important and screen out the rest. For example at a party we are able to screen out the music, other conversations and engage in a conversation with another person.

Flexible/ Divided Attention: Ability to shift attention to and from one set of requirements to another. For example, the ability to multitask – boil vegies and grill meat whilst chatting on the phone, or have a conversation with your passenger whilst driving, or write notes whilst listening to the lecture.

Shifting Attention: The ability to shift our focus from on task to the next.
Functional Implications:
The client may:
Have difficulty staying focused on one task for a reasonable time frame to ensure completion.
Distractible
Mind wanders, loses track of task / conversation
Difficulty coping with more than one thing at a time
May get bored quickly
May seem to switch off and appear not to listen.
May change the subject frequently in conversation.
Assessment for Attentional Deficits

• Observation of attention and concentration in functional tasks and cognitive and perceptual assessments.

• Meal preparation tasks are an excellent task to assess divided attention / multi tasking capacity.

• Standardised cognitive assessments help to determine sustained attention and distractibility by observing behaviours throughout the test.

• Observation of skills in maintaining concentration during meal times in busy patient dining room or cafe

• Observation of attention and distractibility in group therapy session where attentional demands may be greater than what is required in an individual therapy session.
Interventions for Attentional Deficits

- There is Level One evidence for cognitive therapy in the rehabilitation of attention and concentration deficits. A systematic review has found that cognitive rehabilitation improved measures of alertness and sustained attention (Lincoln, Majid & Weyman, 2003 – Cochrane review).
- Activities should be motivating for the client so incorporate their interests into session to enhance motivation to attend.
- Practice tasks involving attention and concentration with the aim of upgrading attentional abilities.
- Break tasks into steps and complete step by step.
- Reduce distractions (e.g., TV, other people, noise).
- Use short simple sentences.
- Work in short burst with regular breaks.
- Change activities frequently but upgrade amount of time on each activity each session.
- Time each activity session to assist with upgrading.
- When distracted, bring them back to the task.
- Take frequent breaks from activities.
- Provide positive feedback for attending for a specified period.
Metacognition

Metacognition is our knowledge and beliefs about our own cognitive processes and capacities. It is self awareness and insight into our own limitations, strengths and capacity to complete tasks. Impairments in self awareness/insight results in an inability to recognize deficits or problem circumstances caused by neurological injury. There is a failure to acknowledge impairments of cognitive and/or motor function when questioned.

Functional Implications

Deficits in metacognition are a significant impediment to rehabilitation as it often causes:

- Poor compliance
- Poor motivation
- Unrealistic expectations
- Impaired judgment and safety
- Inability to accept and use compensatory strategies

Crossan's Level of Awareness

- **Anticipatory Awareness**: The ability to anticipate that a problem will occur as a result of some deficit and make adjustments before the deficit interferes with performance.
- **Emergent Awareness**: Understanding that a deficit exists and how it is impacting on performance.
- **Intellectual Awareness**: Understanding that a particular function is impaired

WHEN BILLY WILLIAMS
First Became Self Aware
Assessment of Metacognition

Standardised Assessment

- Contextual memory test – memory test that also assesses level of awareness of deficit.

Non – Standardised Assessment

- Clinical observation and discussion on perception of performance
- Specific questions: Do you feel you have any changes in your thinking or memory following your brain injury? Do you think you would be able to go shopping/ shower yourself/ attend to banking/ return to work/ driving?
Interventions to improve meta-cognition

- Use feedback to highlight abilities and limitations in function to gently remind the client of their deficits.
- Provide clear, simple and frequent explanations of why the client cannot do something.
- Point out the negative consequences of the client’s unrealistic plans.
- Don’t try to argue or reason.
- Place external limitations where necessary (e.g., removal of drivers licence, car/ disconnecting gas/ stove).
- Expose the client to reality testing experiences gradually and in a supervised way.
- Graded use of prompting.
Orientation

The awareness of self in relation to one’s physical and temporal environmental that depends upon reliable integration of attention, memory and perception. Relates to awareness of self in regards to person, place, time and circumstance.

**Functional Implications:** The client may not know where they are, time of day, day of week, year, etc. (often linked with poor memory)

Intervention for disorientation

- Use of an orientation board, calendar, diary, clock, watch.
- Daily orientation drills using whiteboard
- Provide prompts to cues to assist with orientation, e.g., have you had lunch yet?, check your watch/clock/calendar, look outside, look around.
- Graded use of prompting.
Initiation

The ability to start a task or a step within a task.

**Functional Implications:** Initiation is a frontal lobe function and deficits in this function can lead to the client not starting an activity or next step in a task of their own volition. The client may not seek out another task once one completed. May sit rather than initiate feeding or showering.

**Assessment:** General observation in functional tasks and on the ward

**Interventions:**
- Structure days using timetable without long periods of planned inactivity.
- Set up the environment to initiate action, e.g., job list, timetable or alarm.
- Provide rewards for showing initiative.
- Educate family/friends to minimise directive prompts to facilitate initiation.
- Link activities with rewards and client’s interests.
- Practice functional tasks and encourage initiation with graded support and prompting.

Problem solving occurs whenever the situation is different from a desired situation or goal and the person does not immediately know what series of actions to take. It requires attention, the ability to devise and initiate a plan, information access and a feedback system, which gives information on the effectiveness of the solution and the need for revision.

Functional Implications:
A client with difficulties in problem solving may have difficulty working out solutions or alternatives to problems or situations, May have one-track thinking, give up easily, may make the same mistake several times, May be able to identify the mistake but unable to work out how to correct. May be unable to work out how to use unfamiliar stove, microwave, kettle, taps shower hose etc. May be unable to work out how to address home safety issues.

Darrell suspected someone had once again slipped him a spoon with the concave side reversed.
Assessment: OT Functional ADL assessments, non standardised problem solving picture cards, problem scenario questions in functional cognitive screens

Example problem solving questions:

You arrive home and realise that your phone has no dial tone. What would you do?

You have 3 bills due, your electricity bill, your mobile phone bill and your credit card bill. You don’t have enough money to pay these bills, what would you do?
Interventions for Problem Solving Difficulties

- Practice functional tasks and encourage problem solving with graded support and prompting.
- Facilitate the planning of the task prior to commencing.
- Follow a plan, guideline or instructions.
- Break down the problem into parts.
- Approach the task step by step completing each step before moving on.
- Provide a choice of solutions
- Practice tasks in variable environments
- Discuss alternatives and pro and cons of alternatives discussed.
- Reduce novel demands placed on the person
- Educate the family and friends about allowing the person to do their own problem solving
- Graded use of prompting.
Sequencing

The ability to put steps in an appropriate order / sequence to achieve a goal.

Functional Implications:
Difficulty getting things in the correct order. May turn off water before using soap, put shoes on before socks, may dress before applying deodorant, may attempt to dry before turning off water, may pour water from jug before it is boiled.
Sequencing Interventions

• Practice functional tasks and encourage sequencing with graded support and prompting.
• Encourage planning before commencing task.
• Write down steps in the task and use as a prompt sheet – you can laminate them and use in the shower
• Use a mirror to assist with dressing and grooming.
• Provide non-directive prompting to inform of problem but allow problem solving. E.g. – look in the mirror.
• Practice sequencing with picture cards of functional activities or written steps.
• Graded use of prompting
Use prompt sheets to assist with sequencing
Planning and Organisational Skills

The ability to conceptualise change from the present situation, relate objectively to the environment, conceive alternatives, weigh alternatives and make a choice, and develop a structure or framework to give direction to carrying out the plan.

Functional implications:
The client may not consider the end results in their actions, may have trouble organising their thoughts and explaining things to others, may have difficulty working out steps involved in task, may complete task in a disordered way, may not be able to plan ingredients for a meal, may be disorganised when shopping, may be unable to organise items required for showering. May have poor timing with cooking i.e. meat cooked before boiling vegetables, may not put brakes on wheelchair before transferring

Interventions for planning difficulties

- Encourage thinking about the task and planning before the task is commenced.
- Write down steps generated in planning session.
- Give real but limited choices in decision making.
- Use of daily and weekly timetables
- Use of diary and calendars to organise time.
- Review performance with patients and allow them to identify a better way to complete the task.
- Provide a written structure which outlines steps, items required etc
- Practice functional tasks and encourage planning with graded support and prompting
- Graded use of prompting.
Outcome Measures

Outcome measures seek to establish the effectiveness of the interventions.

Methods of evaluation for cognitive interventions may include:

- Re-administration of standardised assessments conducted previously – this will show impairment based improvements and compare performance against age related normative data.

- Re-evaluation using FIM, Barthel Index – will show functional improvements.

- Review performance against previously set goals (COPM). This highlights the need of goals to be measureable, achieveable and specific.
References


R. das Nair & N. Lincoln *Effectiveness of Memory Rehabilitation After Stroke* *Stroke* 2008, 39:516


