

Guidelines for Concussion / Mild Traumatic Brain Injury & Persistent Symptoms

Second Edition

For adults (18+ years of age)



Module 9: Persistent Cognitive Difficulties



Ontario Neurotrauma Foundation
Fondation ontarienne de neurotraumatologie

MODULE 9: PERSISTENT COGNITIVE DIFFICULTIES



Ontario Neurotrauma Foundation
Fondation ontarienne de neurotraumatologie

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Please note, the project team independently managed the development and production of the guideline and, thus, editorial independence is retained.

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The recommendations and resources found within the *Guidelines for Concussion/Mild Traumatic Brain Injury & Persistent Symptoms* are intended to inform and instruct care providers and other stakeholders who deliver services to adults who have sustained or are suspected of having sustained a concussion/mTBI. These guidelines are not intended for use with patients or clients under the age of 18 years. These guidelines are not intended for use by people who have sustained or are suspected of having sustained a concussion/mTBI for any self-diagnosis or treatment. Patients may wish to bring their healthcare and other providers' attention to these guidelines.

The recommendations provided in these guidelines are informed by best available evidence at the time of publication, and relevant evidence published after these guidelines could influence the recommendations made within. Clinicians should also consider their own clinical judgement, patient preferences and contextual factors such as resource availability in clinical decision-making processes.

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Table of Contents

GUIDELINE RECOMMENDATIONS

9. Persistent Cognitive Difficulties	1
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APPENDICES

1.5: Rivermead Post Concussion Symptoms Questionnaire.....	3
9.1: Montreal Cognitive Assessment (MoCA).....	4
A: Project Members	8
B: Other Useful Links/References for Resources to Consider	10

Unique Features & Symbols in the Current Guideline

Hyperlinks

To improve ease of use, the current guideline has embedded hyperlinks to improve navigation between sections, appendices, and so on. For example, by clicking any heading in the table of contents above, you will be taken directly to that particular section in the current PDF document. Also, anytime there is mention of a particular table, figure, appendix or section, you can simply click on it to go directly to that item.

Symbols



The following symbol has been placed to the left of each guideline recommendation that should be prioritized for implementation. This was determined by expert consensus members during the endorsement/prioritization process, where experts were allowed to provide 20 prioritization votes (see Methodology in the Complete Version). Guideline recommendations with a summed prioritization score greater than 20 are key clinical practice guidelines recommendations for implementation.



The following symbol has been placed to the left of one key guideline recommendation in each of the sections that did not include a recommendation with a prioritization score greater than 20 (determined by expert consensus members during the endorsement/prioritization process).

At the bottom of each page in the current document, there is a hyperlinked footer that can be used to return to the table of contents as desired. Also, clicking “Return to Last Page” will take you back to the previously viewed page. (Note: When scrolling through the pages, the “Return to Last Page” button will only return to the last page that was scrolled through).

9 Persistent Cognitive Difficulties

Special contributor: Laura Rees

The presence and persistence of cognitive symptoms following mTBI can impact successful reintegration into work, academic, and social activities following such injuries.¹ mTBI is associated with disruptions in cognitive skills that include difficulties with attention/concentration, speed of information processing, memory, and aspects of executive cognitive skills.^{2,3} In the acute phase of injury there are changes in cerebral metabolic activity and perfusion particularly in the frontal lobes associated with cognitive changes.^{4,5} Generally, the expected recovery from cognitive-based symptoms following mTBI ranges from 1 week to 6 months, with more rapid rates of recovery found in young athletes.⁶ However, a small percentage of individuals (5%-15%)⁷ experience persistent cognitive symptoms beyond the acute phase of recovery, which significantly disrupts their capacity to resume many pre-morbid activities.

Currently, it remains unclear whether persistent cognitive symptoms result from the pathophysiological effects of the injury or are related to the impact of a variety of additional factors that can influence cognitive functioning such as pain, fatigue, medications, sleep, pre-morbid personality factors, litigation, psychological factors and emotional disturbance (i.e., anxiety and depression).⁷⁻¹¹ Additionally, cognitive symptoms do not typically worsen over time as a sole and direct function of the traumatic injury. When such a pattern of complaints is observed, the relative impact of these additional factors should be considered and addressed.

Attempts should be made to document cognitive symptoms in order to characterize the nature of these symptoms and to track progress over time. When evidence for cognitive dysfunction is obtained with screening and does not resolve with treatment of potentially contributing factors or if cognitive symptoms persist at 3 months, practitioners should consider referral for neuropsychological assessment. Impairments identified on neuropsychological assessment may be amenable to specific rehabilitation strategies (e.g., compensatory cognitive strategies) as well as cognitive-behavioural therapy (CBT) focused on education about the commonality of symptom presentation, facilitation of more effective coping strategies and integration of cognitive compensatory strategies. This combination has demonstrated reductions in the presence of persistent symptoms.¹²

RECOMMENDATIONS FOR ASSESSMENT OF PERSISTENT COGNITIVE DIFFICULTIES		
		GRADE
9.1	A patient sustaining a concussion/mTBI should be evaluated for cognitive difficulties using a focused clinical interview, in conjunction with a validated post-concussive questionnaire (Appendix 1.5) and cognition screening tool (Appendix 9.1).	C
9.2	Certain conditions can affect cognition, such as ADHD, learning disabilities, anxiety or mood disorders, pain, fatigue, sleep disturbance, neuroendocrine dysfunction, or substance abuse. These conditions can be co-morbid with mTBI and should be considered and evaluated as necessary.	C
9.3	<i>A patient experiencing reduced cognitive functioning in the first few days following injury, with education and support, should be expected, in the majority of cases, to have these symptoms resolve and pre-injury cognitive functioning return within days or up to three months.*</i>	A
9.4	Patients who have cognitive symptoms that are not resolving and continue to interfere in daily functioning (e.g., school, work) should be considered for referral for neuropsychological assessment. The evaluation may assist in clarifying appropriate treatment options based on individual patient characteristics and conditions.	A

* THIS RECOMMENDATION IS DUPLICATED FROM SECTION/MODULE 2 (SAME AS 2.4).

There is good evidence that early education intervention is associated with a significant reduction in the persistence and misattribution of symptoms. Related interventions include education about the mechanisms of brain injury, reassurance, and early management strategies that include graduated reintegration into physical activity, work, and school, as well as the understanding that symptoms should typically resolve within a 3- to 6-month time frame.^{13,14} Therefore, attempts should be made to document the specific cognitive complaints/symptoms in conjunction with other symptoms as early as possible,

provide or refer to educational material, and track recovery or reported worsening of symptoms over time. Educational material regarding expected outcome following mTBI is readily available and can be provided by various practitioners within the area of mTBI as well as by self (e.g., OT, SLP, family physician, nursing staff, community therapists).

RECOMMENDATIONS FOR TREATMENT OF PERSISTENT COGNITIVE DIFFICULTIES		
		GRADE
9.5	Rehabilitation of cognitive impairments should be initiated if: a. The individual exhibits persisting cognitive impairments on formal evaluation, or b. The learning of compensatory strategies is necessary in order to facilitate the resumption of functional activities and work.	C
9.6	For cognitive sequelae following mTBI, the cognitive rehabilitation strategies that should be considered include compensatory strategies and remediation approaches.	A
9.7	If persisting cognitive deficits are identified by neuropsychologists or other health professionals, efforts should be made to inform employers or teachers of possible temporary accommodations to tasks or schedules (see Section 12) so as to avoid excessive anxiety related to cognitive difficulties and experiencing of repeated errors or setbacks in work or school.	C

RESOURCES		
APPENDICES		
1	Rivermead Post Concussion Symptoms Questionnaire	Appendix 1.5
2	Montreal Cognitive Assessment (MoCA)	Appendix 9.1

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Appendix 1.5

The Rivermead Post Concussion Symptoms Questionnaire*

After a head injury or accident some people experience symptoms which can cause worry or nuisance. We would like to know if you now suffer from any of the symptoms given below. As many of these symptoms occur normally, we would like you to compare yourself now with before the accident. For each one, please circle the number closest to your answer.

- 0 = Not experienced at all
- 1 = No more of a problem
- 2 = A mild problem
- 3 = A moderate problem
- 4 = A severe problem

Compared with before the accident, do you now (i.e., over the last 24 hours) suffer from:

Headaches.....	0	1	2	3	4
Feelings of dizziness.....	0	1	2	3	4
Nausea and/or vomiting.....	0	1	2	3	4
Noise sensitivity, easily upset by loud noise.....	0	1	2	3	4
Sleep disturbance.....	0	1	2	3	4
Fatigue, tiring more easily.....	0	1	2	3	4
Being irritable, easily angered.....	0	1	2	3	4
Feeling depressed or tearful.....	0	1	2	3	4
Feeling frustrated or impatient.....	0	1	2	3	4
Forgetfulness, poor memory.....	0	1	2	3	4
Poor concentration.....	0	1	2	3	4
Taking longer to think.....	0	1	2	3	4
Blurred vision.....	0	1	2	3	4
Light sensitivity, easily upset by bright light.....	0	1	2	3	4
Double vision.....	0	1	2	3	4
Restlessness	0	1	2	3	4

Are you experiencing any other difficulties?

1. _____	0	1	2	3	4
2. _____	0	1	2	3	4

* King N, Crawford S, Wenden F, Moss N, Wade D. The Rivermead Post Concussion Symptoms Questionnaire: A measure of symptoms commonly experienced after head injury and its reliability. *Journal of Neurology*. 1995;242:587-592.

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Appendix 9.1

Montreal Cognitive Assessment (MoCA)

MONTREAL COGNITIVE ASSESSMENT (MOCA)
Version 7.1 Original Version

NAME :
Education :
Sex :

Date of birth :
DATE :

VISUOSPATIAL / EXECUTIVE		Copy cube		Draw CLOCK (Ten past eleven) (3 points)		POINTS		
				<input type="checkbox"/> Contour <input type="checkbox"/> Numbers <input type="checkbox"/> Hands		___/5		
NAMING								___/3
MEMORY	Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.		FACE	VELVET	CHURCH	DAISY	RED	No points
		1st trial						
		2nd trial						
ATTENTION	Read list of digits (1 digit/ sec.). Subject has to repeat them in the forward order	[] 2 1 8 5 4						___/2
	Subject has to repeat them in the backward order	[] 7 4 2						
	Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors	[] FBACMNAAJKLBAFAKDEAAAJAMOFAAB						___/1
	Serial 7 subtraction starting at 100	[] 93	[] 86	[] 79	[] 72	[] 65		___/3
		4 or 5 correct subtractions: 3 pts , 2 or 3 correct: 2 pts , 1 correct: 1 pt , 0 correct: 0 pt						
LANGUAGE	Repeat : I only know that John is the one to help today. [] The cat always hid under the couch when dogs were in the room. []							___/2
	Fluency / Name maximum number of words in one minute that begin with the letter F	[] _____ (N ≥ 11 words)						___/1
ABSTRACTION	Similarity between e.g. banana - orange = fruit	[] train - bicycle	[] watch - ruler					___/2
DELAYED RECALL	Has to recall words WITH NO CUE	FACE	VELVET	CHURCH	DAISY	RED	Points for UNCUED recall only	___/5
	Category cue	[]	[]	[]	[]	[]		
	Multiple choice cue							
ORIENTATION	[] Date	[] Month	[] Year	[] Day	[] Place	[] City		___/6
© Z.Nasreddine MD		www.mocatest.org		Normal ≥ 26 / 30		TOTAL		___/30
Administered by: _____						Add 1 point if ≤ 12 yr edu		

Administration & Scoring Instructions

The Montreal Cognitive Assessment (MoCA) was designed as a rapid screening instrument for mild cognitive dysfunction. It assesses different cognitive domains: attention and concentration, executive functions, memory, language, visuoconstructional skills, conceptual thinking, calculations, and orientation. Time to administer the MoCA is approximately 10 minutes. The total possible score is 30 points; a score of 26 or above is considered normal.

1. Alternating Trail Making

Administration: The examiner instructs the subject: *“Please draw a line, going from a number to a letter in ascending order. Begin here [point to (1)] and draw a line from 1 then to A then to 2 and so on. End here [point to (E)].”*

Scoring: Allocate one point if the subject successfully draws the following pattern: 1 –A- 2- B- 3- C- 4- D- 5- E, without drawing any lines that cross. Any error that is not immediately self-corrected earns a score of 0.

2. Visuoconstructional Skills (Cube)

Administration: The examiner gives the following instructions, pointing to the cube: *“Copy this drawing as accurately as you can, in the space below”.*

Scoring: One point is allocated for a correctly executed drawing.

- Drawing must be three-dimensional;
- All lines are drawn;
- No line is added;
- Lines are relatively parallel and their length is similar (rectangular prisms are accepted).

A point is not assigned if any of the above-criteria are not met.

3. Visuoconstructional Skills (Clock)

Administration: Indicate the right third of the space and give the following instructions: *“Draw a clock. Put in all the numbers and set the time to 10 past 11”.*

Scoring: One point is allocated for each of the following three criteria:

- Contour (1 pt.): the clock face must be a circle with only minor distortion acceptable (e.g., slight imperfection on closing the circle);
- Numbers (1 pt.): all clock numbers must be present with no additional numbers; numbers must be in the correct order and placed in the approximate quadrants on the clock face; Roman numerals are acceptable; numbers can be placed outside the circle contour;
- Hands (1 pt.): there must be two hands jointly indicating the correct time; the hour hand must be clearly shorter than the minute hand; hands must be centred within the clock face with their junction close to the clock centre.

A point is not assigned for a given element if any of the above-criteria are not met.

4. Naming

Administration: Beginning on the left, point to each figure and say: *“Tell me the name of this animal”.*

Scoring: One point each is given for the following responses: (1) lion (2) rhinoceros or rhino (3) camel or dromedary.

5. Memory

Administration: The examiner reads a list of 5 words at a rate of one per second, giving the following instructions: *“This is a memory test. I am going to read a list of words that you will have to remember now and later on. Listen carefully. When I am through, tell me as many words as you can remember. It doesn’t matter in what order you say them”.* Mark a check in the allocated space for each word the subject produces on this first trial. When the subject indicates that (s)he has finished (has recalled all words), or can recall no more words, read the list a second time with the following instructions: *“I am going to read the same list for a second time. Try to remember and tell me as many words as you can, including words you said the first time.”* Put a check in the allocated space for each word the subject recalls after the second trial. At the end of the

second trial, inform the subject that (s)he will be asked to recall these words again by saying, “I will ask you to recall those words again at the end of the test.”

Scoring: No points are given for trials one and two.

6. Attention

Forward Digit Span: Administration: Give the following instruction: “I am going to say some numbers and when I am through, repeat them to me exactly as I said them”. Read the five number sequence at a rate of one digit per second.

Backward Digit Span: Administration: Give the following instruction: “Now I am going to say some more numbers, but when I am through you must repeat them to me in the backwards order.” Read the three number sequence at a rate of one digit per second.

Scoring: Allocate one point for each sequence correctly repeated. (N.B.: the correct response for the backwards trial is 2-4-7).

Vigilance: Administration: The examiner reads the list of letters at a rate of one per second, after giving the following instruction: “I am going to read a sequence of letters. Every time I say the letter A, tap your hand once. If I say a different letter, do not tap your hand”.

Scoring: Give one point if there is zero to one errors (an error is a tap on a wrong letter or a failure to tap on letter A).

Serial 7s: Administration: The examiner gives the following instruction: “Now, I will ask you to count by subtracting seven from 100, and then, keep subtracting seven from your answer until I tell you to stop.” Give this instruction twice if necessary.

Scoring: This item is scored out of 3 points. Give no (0) points for no correct subtractions, 1 point for one correct subtraction, 2 points for two-to-three correct subtractions, and 3 points if the participant successfully makes four or five correct subtractions. Count each correct subtraction of 7 beginning at 100. Each subtraction is evaluated independently; that is, if the participant responds with an incorrect number but continues to correctly subtract 7 from it, give a point for each correct subtraction. For example, a participant may respond “92 – 85 – 78 – 71 – 64” where the “92” is incorrect, but all subsequent numbers are subtracted correctly. This is one error and the item would be given a score of 3.

7. Sentence Repetition

Administration: The examiner gives the following instructions: “I am going to read you a sentence. Repeat it after me, exactly as I say it [pause]: **I only know that John is the one to help today.**” Following the response, say: “Now I am going to read you another sentence. Repeat it after me, exactly as I say it [pause]: **The cat always hid under the couch when dogs were in the room.**”

Scoring: Allocate 1 point for each sentence correctly repeated. Repetition must be exact. Be alert for errors that are omissions (e.g., omitting “only”, “always”) and substitutions/additions (e.g., “John is the one who helped today;” substituting “hides” for “hid”, altering plurals, etc.).

8. Verbal Fluency

Administration: The examiner gives the following instruction: “Tell me as many words as you can think of that begin with a certain letter of the alphabet that I will tell you in a moment. You can say any kind of word you want, except for proper nouns (like Bob or Boston), numbers, or words that begin with the same sound but have a different suffix, for example, love, lover, loving. I will tell you to stop after one minute. Are you ready? [Pause] Now, tell me as many words as you can think of that begin with the letter F. [Time for 60 sec]. Stop.”

Scoring: Allocate one point if the subject generates 11 words or more in 60 sec. Record the subject’s response in the bottom or side margins.

9. Abstraction

Administration: The examiner asks the subject to explain what each pair of words has in common, starting with the example: “Tell me how an orange and a banana are alike”. If the subject answers in a concrete manner, then say only one additional time: “Tell me another way in which those items are alike”. If the subject does not give the appropriate response (fruit), say, “Yes, and they are also both fruit.” Do not give any additional instructions or clarification. After the practice trial, say: “Now, tell me how a train and a bicycle are alike”. Following the response, administer the second trial, saying: “Now tell me how a ruler and a watch are alike”. Do not give any additional instructions or prompts.

Scoring: Only the last two item pairs are scored. Give 1 point to each item pair correctly answered. The following responses are acceptable: Train-bicycle = means of transportation, means of travelling, you take trips in both; Ruler-watch = measuring instruments, used to measure. The following responses are not acceptable: Train-bicycle = they have wheels; Ruler-watch = they have numbers.

10. Delayed Recall

Administration: The examiner gives the following instruction: “I read some words to you earlier, which I asked you to remember. Tell me as many of those words as you can remember.” Make a check mark (✓) for each of the words correctly recalled spontaneously without any cues, in the allocated space.

Scoring: Allocate 1 point for each word recalled freely without any cues.

Optional: Following the delayed free recall trial, prompt the subject with the semantic category cue provided below for any word not recalled. Make a check mark (✓) in the allocated space if the subject remembered the word with the help of a category or multiple-choice cue. Prompt all non-recalled words in this manner. If the subject does not recall the word after the category cue, give him/her a multiple choice trial, using the following example instruction, “Which of the following words do you think it was, NOSE, FACE, or HAND?” Use the following category and/or multiple-choice cues for each word, when appropriate:

FACE:	category cue: part of the body	multiple choice: nose, face, hand
VELVET:	category cue: type of fabric	multiple choice: denim, cotton, velvet
CHURCH:	category cue: type of building	multiple choice: church, school, hospital
DAISY:	category cue: type of flower	multiple choice: rose, daisy, tulip
RED:	category cue: a colour	multiple choice: red, blue, green

Scoring: No points are allocated for words recalled with a cue. A cue is used for clinical information purposes only and can give the test interpreter additional information about the type of memory disorder. For memory deficits due to retrieval failures, performance can be improved with a cue. For memory deficits due to encoding failures, performance does not improve with a cue.

11. Orientation

Administration: The examiner gives the following instructions: “Tell me the date today”. If the subject does not give a complete answer, then prompt accordingly by saying: “Tell me the [year, month, exact date, and day of the week].” Then say: “Now, tell me the name of this place, and which city it is in.”

Scoring: Give one point for each item correctly answered. The subject must tell the exact date and the exact place (name of hospital, clinic, office). No points are allocated if subject makes an error of one day for the day and date.

TOTAL SCORE: Sum all subscores listed on the right-hand side. Add one point for an individual who has 12 years or fewer of formal education, for a possible maximum of 30 points. A final total score of 26 and above is considered normal.

Appendix A

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* The recommendations in this document are those of the Ontario Neurotrauma Foundation, identified by the guideline development team and expert consensus group members, and do not necessarily represent agreement of or endorsement by the Centers for Disease Control and Prevention.

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Appendix B

Other Links/References for Resources to Consider

Section 9: Persistent Cognitive Difficulties

Mini Mental State Examination (MMSE)

A brief screening tool to provide a quantitative assessment of cognitive impairment and to record cognitive changes over time. It includes tests of orientation, attention, memory, language and visual-spatial skills.

Folstein MF, Folstein SE, McHugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*. 1975 Nov;12(3):189-198.