



CONCUSSION/MILD TRAUMATIC BRAIN INJURY: A WHOLE BODY CONDITION



A GUIDE TO AID in CONCUSSION RECOVERY BY USING
EVIDENCE BASED EDUCATION AND RECOVERY STRATEGIES

YOUR FIRST ACTION WHEN DIAGNOSED WITH A CONCUSSION SHOULD BE TO SEEK MEDICAL HELP TO OPTIMIZE YOUR RECOVERY.

The following help guide is intended to provide patients and families with education, instruction and direction in the management of **CONCUSSION/MILD TRAUMATIC BRAIN INJURY** (mTBI).

A concussed person is **NOT TO BE LEFT ALONE** for the 1st 24 hours in case of a delay in symptoms, but there is no need to be woken every hour.

2nd IMPACT SYNDROME is a rare but potentially fatal condition should you hit your head before your concussion symptoms have resolved, so **AVOID ANY RISK** of this happening.

SEEK IMMEDIATE MEDICAL HELP IF ANY OF THE SIGNS LISTED BELOW ARE OBSERVED FOLLOWING A HEAD INJURY:

Headache worsening	Very drowsy, can't be wakened
Seizures (convulsions or fixed stare)	Repeated or forceful vomiting
Unusual behavioral change	Slurred speech
Unsteadiness or clumsiness	Weakness or numbness in arms/legs
Blurred vision or unequal pupils	Blood or fluid coming from ears or nose

KEYS TO BEST PRACTICE

- Concussion is a treatable injury especially when early intervention strategies are adopted.
- No two concussions are the same, therefore they require a personalized and specialized approach.
- The following information is best utilized under the guidance of healthcare professionals experienced in concussion/mTBI management.

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CONCUSSION DEFINED

Concussions are mild traumatic brain injuries (mTBI), occurring with an impact to the head, neck or body resulting in an impulsive force being transmitted to the brain. This causes electrical and chemical changes, possible blood flow change and inflammation in the brain. Symptoms and signs may present immediately or be delayed. At least one of these signs or symptoms should be present to operationally define the acceleration force as a concussion:

- Any occurrence of memory loss before, during or after the event
- Any alteration in mental state (dazed, fuzzy, feeling out of it or confused)
- Any neurological deficits (headache, dizziness, nausea etc.)
- Any loss of consciousness (less than 20%, however, get “knocked out”)

Concussion results in a range of clinical symptoms and signs which may or may not involve loss of consciousness.

mTBI's result in a number of symptoms that are **TYPICALLY SHORT LIVED** and are often not revealed by standard neuro-imaging such as MRI or CT scans.

mTBI **SYMPTOMS CAN BE DELAYED** for up to 48 hours or longer. Common Symptoms:

PHYSICAL

Headache

Nausea or vomiting

Dizziness or light headedness

Imbalance

Sensitivity to light or noise

BEHAVIOURAL/ EMOTIONAL

Sleep Disturbance

Drowsiness or Fatigue

More Emotional

Irritable, anxious or depressed

COGNITIVE

Difficulty thinking or concentrating

Memory problems

Trouble finding words

Confusion

Feeling mentally foggy

STEP 1: RELATIVE REST

HEALING: Good news, the brain has the capacity to heal and recover. The brain's capacity to heal is enhanced when the brain is not put under too many demands after injury.

Unlike an ankle sprain, which is easy to protect following injury, our brain doesn't have another leg to take up the slack. This highlights the importance of relative rest and early intervention strategies following concussion.

RELATIVE REST IS THE CORNERSTONE OF MANAGEMENT:

FIRST 48 HOURS LOW STIMULUS: it is safest to initially stop all:

1. Sport and Exertion Activity
2. School
3. Work

This is to protect the injured brain and establish a clear starting point for recovery from which you can build on.

AVOID

- Initially being in loud or crowded places
- Initially visually stimulating environments (i.e. grocery stores, driving etc.)
- Initially watching TV, computer or reading
- Initially multitasking or physical exertion

RELATIVE REST FIRST 48 HRS:

Do activities of daily living/light exercise that do not overly provoke symptoms and build from there.

- It is best to take small steps, one at a time with tasks & activities.
- If symptoms ***increase by more than 2/10***, **STOP** activity or task until symptoms decrease and modify appropriately.

RESTFUL ACTIVITY SUGGESTIONS:

- Switching tasks between thinking and doing (i.e. reading vs dishes)
- Napping (try to keep to 20 minutes)
- Relaxation, bathing, mindfulness, meditation, stretching
- Listening (audio-books, podcasts)
- Brain breaks between or during tasks or activities
- Eating and drinking regularly
- Being in nature
- Light walking, stretching, restorative yoga

Give yourself all the time you need to heal, and avoid putting yourself on a time-table.

STEP 2: UNDERSTAND YOUR INJURY

- 1.) **OVERSTIMULATION:** is an increase in symptoms due to your brain being overwhelmed by incoming information that you may or may not be aware of (i.e. lights, background noise, moving objects or busy environments).

AKA “Flooding” or being easily overwhelmed is often a result of the loss of the brain's ability to filter information coming in. This may be due to a post injury “fight or flight” response, which results in a heightened state of alertness.

- 2.) **ENERGY CRISIS:** Your injured brain now requires more energy for every day cognitive, physical and emotional tasks with less in reserve (Figure 2) at a time when there are less energy resources available.

Be careful with your mental and physical effort as during the early stages of recovery, altered blood flow to the brain leads to energy demands often exceeding supply.

BEFORE
Concussion

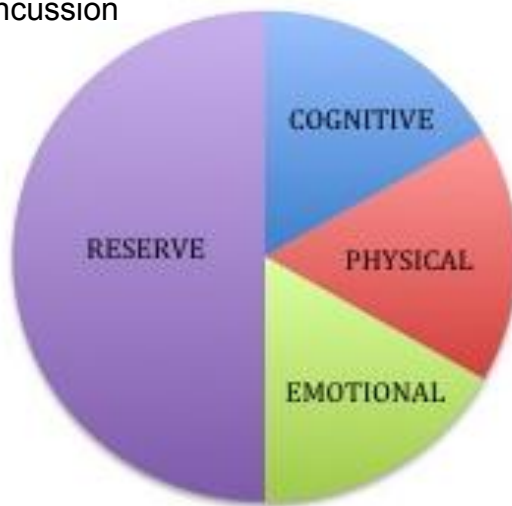


Figure 1. Use of Energy by the brain prior to Concussion/mTBI.

AFTER
Concussion

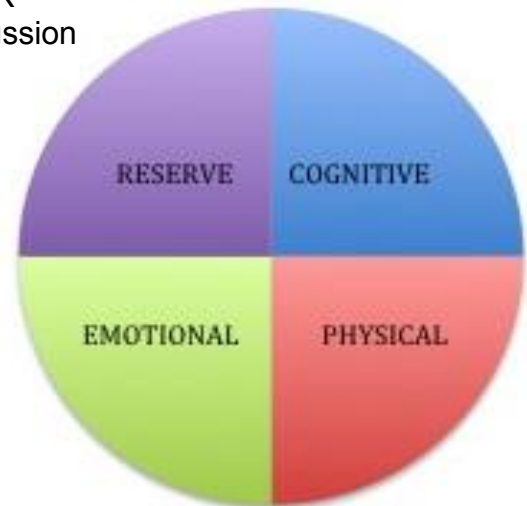


Figure 2. Lack of reserve energy to assist with recovery of the brain following a concussion/mTBI, in a time where you need excess energy for everyday function.

*“The secret of change is to focus all of your energy, not on fighting the old,
but on building the new” – Socrates*

STEP 3: IMPLEMENT BRAIN INJURY MANAGEMENT STRATEGIES

Inevitably you will come across situations/tasks that provoke symptoms or create “flooding” and so when you do, follow the coping strategies below:

1. Flooding: 6 R's FOR COPING STRATEGIES



Recognize the things that trigger FLOODING and what the warning signs are. Symptoms often include headache, confusion, feeling overwhelmed or tired, irritability etc.



Reduce exposure to situations or places that induce over stimulation or sensory overload.

This may involve wearing shades or brimmed hats to reduce bright lights, going shopping during quieter periods and making shopping lists, reducing excessive noise or background noise with ear buds or plugs or by avoiding busy places,



Retreat from triggers that are resulting in FLOODING and redirect to another thought or activity or simply walk away.



Relax from FLOODING by calming your brain with a BRAIN BREAK OR BOOST.



Rethink what you are doing and implement wellness strategies to manage FLOODING.



Return to what works and modify what does not while setting realistic goals for success. Strengthen neural connections by working on progressive trigger exposure, starting with the mildest first for a few minutes. Repeat exposure to the trigger several times a week and gradually increase exposure only when comfortable and while avoiding FLOODING.

Adapted from the Northern Brain Injury Association Webcast

With education, practice and determination, you can overcome what's holding you back.

2. ENERGY CONSERVATION and BUDGETING

Due to post concussion reduced brain blood flow, your brain is in an energy crisis.

If we liken brain energy resources to money in the bank, then energy conservation is like being on a budget.

It is essential you are frugal with your energy funds to avoid blowing your reduced energy budget.

BEFORE
Concussion



AFTER
Concussion



Examples of common brain energy “deposits” and “withdrawals” include:

Deposits (Brain Breaks or Boosts)		Withdrawals (Triggers)
1.	Healthy eating and drinking	Multi-tasking
2.	Sitting in nature	Focused thinking
3.	Walking	Loud busy environments
4.	Relaxation, Mindfulness	Over-exerting physically or mentally
5.	Sleep	Stress
6.	(Fill In Your Own)	(Fill In Your Own)
7.	(Fill In Your Own)	(Fill In Your Own)
8.	(Fill In Your Own)	(Fill In Your Own)

You manage your energy budget by making deposits and withdrawals based on requirements. This is best done through **PLANNING, PACING & PRIORITIZING**.

The difference between a brain that is resourceful and functioning well and one that isn't is only a 100 milli-seconds of brain speed.

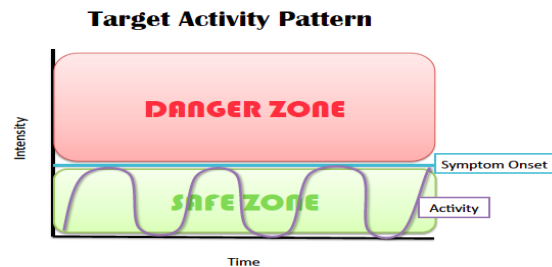
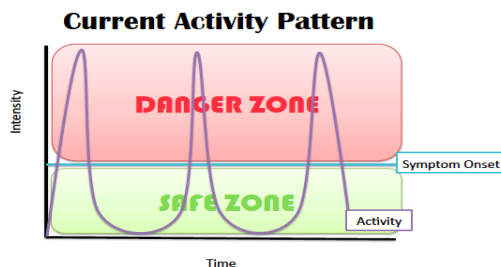
3. PLANNING, PACING & PRIORITIZING

Due to a limited energy budget and heightened alert system, it is easy to overwhelm your brain at a critical time when it is trying to recover.

With the pacing graphs below, the **safe zone** represents when you are **symptom free or mildly symptomatic 2/10**, with the **danger zone** representing **increased symptoms > 2/10**.

CURRENT ACTIVITY PATTERN (often acutely): your injured brain can easily be overwhelmed so be careful when doing activities so as to not go into the danger zone or push through symptoms greater than a 2/10 increase. Mild symptom exacerbation is okay. Crossing into the danger zone can lead to set backs in recovery (Graph 1). Moderate or severe symptom exacerbation is not okay!

TARGET ACTIVITY PATTERN: The goal is to perform activities that avoid going into the danger zone (Graph 2) to promote optimal recovery. These activities that put you in the danger zone can vary day to day, so it is important to be aware of how you are feeling daily.



PLAN your day/week in advance, which allows you to schedule necessary rest breaks and spread activities across days/week.

PACE yourself by slowing things down (set timers to restrict from overdoing), doing one task at a time or break up tasks over day/week.

PRIORITIZE: perform more difficult tasks when you have more energy i.e. after eating/drinking, in the morning or after rest when your brain energy bank is topped up.

CREATING AGENDAS or NOTE TAKING so you don't have to waste resources on memory.

TRACKING activities can help you determine if there is relationship between certain activities and symptom onset.

LONG TERM ACTIVITY PLAN: over time your safe zone will increase while your danger zone decreases indicating the brain is healing.



"Insanity is doing the same thing over and over again and expecting different results" – David Boswell

4. WELLNESS STRATEGIES

SLEEP:

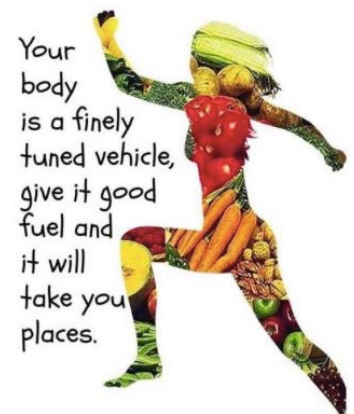
Lack of sleep affects our daily function as well as our physical and mental wellbeing. It is critical following a head injury that you get good restorative sleep every night, as it is a function of a strong recovery.

- Extra sleep may be necessary in the days immediately following a head injury, but approximately 8 hours of sleep every night is optimal.
- Get on a good sleep routine (consistent sleep and wake times) and limit daytime napping to approximately 20 minute sessions.
- Allow at least 1 hour before bedtime to unwind. Best to avoid stimulants like TV, computer use and phone, caffeine and late eating before bed.

NUTRITION:

It is important to note that what we eat affects our brain and that consuming select nutrients can influence neural function.

- Eat small meals every 3-4 hours to maintain blood sugar levels.
- Snack about every hour through the day to boost or top up energy.
- Try to stick to a regular schedule of eating, as the body likes routine.
- Make shopping lists and shop when it is least crowded at the grocery store.
- Ensure you are well fed before physical or mental activities in order to meet adequate brain energy needs
- Stay hydrated by drinking water about every hour
- Consume nutrients with possible brain health benefits:
Fish,(omega 3's) poultry, dairy, meat, nuts and turmeric, to name a few.



OVERSTIMULATION:

Overstimulation is inevitable, but realize you have control of how this affects you. The first step is listening to your body and recognizing the source and putting strategies in place to reduce it.

- Wear sunglasses or brimmed hat to dim light exposure when necessary.
- Wear ear buds/plugs to decrease noise when necessary.
- Some exposure to stimulation will help your brain adapt, just try to limit symptom exacerbation to mild 2/10.

MINDFULNESS

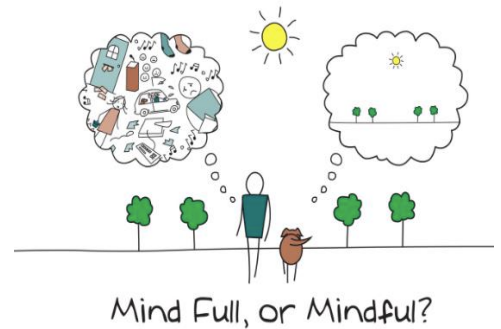
- Mindfulness is the process of mentally focusing on being in the present moment. It has proven to be an effective tool to help people with a concussion/mTBI manage their thoughts and emotions and calm their mind.
- The act of being mindful is learning that you do not have to be attached to your thoughts and feelings and lack control over your reaction to them.

Three Minute Breathing Space: use this quick mindfulness meditation whenever you need to have a “Brain Break” or settle your mind.

○ **STEP 1: Becoming Aware**

Try sitting straight up in a chair with feet lightly resting on the ground if possible. Close your eyes and bring your awareness to your inner experience for 1 minute:

- What is your experience right now?
- What thoughts are going through your mind?
- Are there any sensations of tightness or stiffness?



○ **STEP 2: Gathering**

As best you can re-direct your focus to breathing, the feeling of the belly moving in and out, expanding as the breath goes in and falling back when the breath falls out. Follow the breath in all the way and out, using each breath, anchor yourself in the present moment for 1 minute.

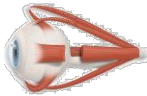
○ **STEP 3: Expanding**

Breathe into your whole body, so you are expanding your awareness. Sense your body as a whole, feeling the whole body rise and fall with each inhalation and exhalation for 1 minute.

For further information on mindfulness, visit Jon Kabat-Zinn's website at www.mindfulnesscds.com, or download the App Headspace.

5. SYSTEMS CHECK

- Following a concussion it is common to have symptoms associated with the eyes, ears, neck, balance, dizziness and/or headaches.
- It is best to be assessed by a health care practitioner experienced in concussion management to determine the source of symptoms and implement corrective strategies.

	SYSTEM'S AFFECTED	SYMPTOMS	TREATMENTS	WHO CAN HELP?
	Inner Ear - Vestibular - Gravity detector - Speed of movement - Head + eye coordination	- Dizziness/vertigo - Imbalance	- Vestibular Rehab which aims to re-establish normal integration of sensory input from the ears, eyes and joint receptors	- Physiotherapy - Audiology - ENT
	Visual - Converge/diverg - Saccades - Smooth pursuit	- Blurry or double vision - Eye strain - Headache	- Visual Re-training	- Optometry - Occ. Therapy
	Cognition Cardiovascular	- Mental - Fatigue/foggy - Slowed processing - Headache	- Neuro-feedback - Cognitive training - Graded exercise Retraining	- Psychiatry - Psychology - Osteopath
	Anxiety/Mood	- Anxious - Stressed - Depression - Irritability	- Counseling - Mindfulness	- Chiropractor - Massage Therapy
	Neck	- Headache - Imbalance - Neck pain and restriction	- Manual therapy - Dry needling - Acupuncture - Cranial sacral	

- Neuroplasticity is the brain's ability to change itself and so the good news is the brain is trainable.
- One of the effects of training is through compensation, which relates to the brain's ability to generate new pathways or connections in response to brain injury or dysfunction.
- If symptoms return, they can once again be settled by the very exercises and management strategies that settled them previously.
- As with any exercise, the gains made are often lost when you stop working out. The brain is no different, so if you want to keep the gains then keep up a maintenance routine.

"Forget all the reasons why it wont work and believe the one reason why it will" – Unknown

STEP 4: RETURN TO FUNCTION, LEARN/WORK AND ACTIVITY/SPORT

Once you have implemented your management strategies and you have **RETURNED TO NORMAL FUNCTION** with mild symptoms you can begin a gradual return to normal activities.

- Most people return **TOO QUICKLY** to activities resulting in set backs, so be careful and take a gradual approach.
- RETURN TO LEARN/WORK(1) activities before RETURN TO ACTIVITY/SPORT(2) step progression with guidance. **SEE US FOR MORE DETAILED RETURN PROTOCOLS.**

If any symptoms such as headache, nausea or dizziness increase by > 2/10 (MILD) during activity or exercise **STOP**, you pushed too hard and need to reduce the effort next time.

You should only progress to level 2 and 3 if there are no or mild increase(2/10)in symptoms and then onto levels 4-6 if there are no symptoms. Leave 24 hours between stages.

Stage	6 Stages of Rehabilitation	Return To Function/ Learn, Work/Sport Progression	Objective of Stages
1	Symptom-limited activity	Physical and mental symptom limited rest, mild symptoms ok 2/10	- Recovery
2	1.Home based school activity or work activity 2. A) aerobic activity light: 55% heart rate B) aerobic activity moderate: 70% heart rate	- light school or work simulated tasks, easy walking - Swimming, stationary cycle at 55 -70% or less of predicted max heart rate(220-age)	- Re-introduce tasks - Restore normal heart rate and blood pressure
3	1.Return to school part time Possible modified part time work 2.Sports specific exercise (with no risk of head contact otherwise requires medical clearance and nil symptoms.)	- Short homework blocks (computer, reading etc) - Short admin type tasks - Skating, running, bike, no head impacts	- Add cognitive load - Add movement
4	1.Return to school fulltime Job specific part time/fulltime work 2.Non contact training drills	- Modified academics /work tasks - More complex training i.e. snow sports, hockey or football practice, weights at gym	- Increase stamina with cognitive load, exercise, coordination
5	1. Full time +/- modified work 2. Full contact practice	Following medical clearance - Return to normal work, sport high level training, no competition	- Restore Confidence, and activity tolerance
6	Return To Play	Normal game play	Return to full activity

If symptoms return at all in stages 4 to 6, an athlete/worker should stop these activities, as this may be a sign the brain is not healed. Rest 24 hours and reduce symptoms to zero and then start again at the step during which the symptoms were experienced. Only move onto the next step when there are no symptoms.

Again, steps 1-3 mild 2/10 symptom exacerbation is ok and can benefit recovery. No symptoms to progress steps 4-6 as these steps increase demands on your body and brain and may have increased risk of head contact. It is best practice and safer to slow the progression down and fully allow the brain to heal.

STEP 5: EDUCATING OTHERS ON YOUR LIMITATIONS

- **Expectations:** brain rehabilitation takes time, often being measured in months or years. Please resist expecting me to be who I was, even though I appear fine on the outside.
- **Rest:** is an active part of my recovery. I need more rest than I used to as it now takes more energy for me to complete the same tasks as before.
- **Stamina:** even though I may look better on the outside, my stamina will fluctuate with some days being better than others. Pushing too hard or through symptoms can lead to increased symptoms and setbacks.
- **Patience:** is the gift you can give me, for example:
 - **Socially:** I may not be as social or as outgoing during the beginning stages of my recovery. Visually demanding and loud environments can quickly overload my brain. Limiting my exposure or having to leave the area all together is a management strategy, not avoidance.
 - **Pacing:** slowing down and alternating periods of activity with “brain breaks” allows me to work deliberately and at my own pace helping me rebuild healthy brain pathways. Rushing and multi-tasking can make symptoms worse and slow recovery.
 - **Listening:** please listen to me with patience and try not to interrupt. Allow me to find my words and my thoughts.
 - **Conversation:** If there is more than one person talking it is difficult for me to process the information quickly enough to keep up. I may need to take a break, not because I am being rude, but because my brain is being overloaded.
 - **Breaks:** If I say I need to stop, I need to stop NOW. This is not because I am avoiding the subject or task. I just need time to process the information and take a break from concentrating.
 - **Memory:** know that not remembering does not mean I don't care, my brain is just not working yet like it was.
 - **Behavior:** I may get easily angered or upset in response to something I normally wouldn't or the reaction itself may seem more intense than usual. This is an indication of my current inability to cope with specific situations or environments.
 - **Sensitivity:** to light, noise and emotions is part of the change to my brain which may require me to leave over stimulating environments from time to time.

I need cheer leaders now as I begin to recover, just like children do when they are learning and growing up. Please help me and encourage all my efforts. Please don't be negative or critical as I am doing the best I can.

“Perseverance is not a long race; it is many short races one after another” – Walter Elliot

STEP 6: WELLNESS CHECKLIST

RELATIVE REST

- ☐ First 48 hours low stimulus relative rest (avoid computer, TV, exertion, sport, work and school)
- ☐ After 48 hours progress to light aerobic and cognitive activity, symptoms can mildly elevate 2/10
- ☐ Manage activity to rest ratio: ie. 15 min activity blocks followed by brain breaks or “deposits”
- ☐ Take regular “brain breaks” such as getting out in nature.

OVERSTIMULATION

- ☐ 6 R's for coping
- ☐ Reduce with graded exposure or management tools such as sun shades, or ear buds

PLANNING, PACING & PRIORITIZING

- ☐ Plan day/week ahead and schedule rest breaks
- ☐ Spread out more challenging activities through day or perform in the morning or after eating when energy levels are topped up
- ☐ Follow up a brain “withdrawal” with a “deposit” to manage brain energy funds
- ☐ Do one activity at a time and slow it down

SLEEP

- ☐ Get on a good sleep routine with ~ 8 hours a day, and limit to 20 minute daily naps.
- ☐ Unwind before bed avoiding stimulating activities at least 1 hour before bed.

NUTRITION

- ☐ Stick to a regular eating routine of ~3-4 meals a day
- ☐ Snack and hydrate regularly ~ every hour to keep energy levels topped up

SYSYEMS CHECK

- ☐ Rehabilitate daily for faulty systems (VISUAL, VESTIBULAR, NECK etc), as the sooner they are worked on the sooner they can recover.

RETURN TO ACTIVITY

- ☐ Return to Function (activities of daily living) first followed by return to learn/work then sport while guided by your symptoms. Keep symptoms mild stages 1-3. No symptoms to progress to stages 4-6. Symptoms mean you pushed too hard and your brain is not ready.
- ☐ Ensure you progress in a gradual way with 24 hours between each step

Things to keep in mind during your recovery

You may question whether you are able to function as you would normally but you will eventually get back to your baseline and/or adapt. A key part of the process is to educate yourself on concussion and recovery principles, to identify current limitations and then follow a graduated rehabilitative progression while your brain heals from the concussion.

If you would like more information on your concussion diagnosis and a recovery plan, book a consultation with a physiotherapist or other qualified health professional. They will do a thorough concussion assessment to identify and address issues such as abnormal exercise responses (elevated heart rate); neck soreness; and/or vestibulo-ocular (balance/dizziness) deficits and will provide further education and treatment as well as guidance in recovery strategies to get you back to activity safely.



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