

Active Rehabilitation Protocol (ARP)

What is the Active Rehabilitation Protocol (ARP) for Traumatic Brain Injury (TBI)?

“Active Rehab” is the step-wise progression of light aerobic exercise used to reduce the length of concussion and post concussion syndrome. The benchmark for concussion management has long been complete cognitive and physical rest until concussive symptoms had fully resolved. These recommendations were based on long standing treatment practices with little evidence showing a positive effect on prognosis. However, recent evidence by The University of Pittsburg, Buffalo, Children’s Montreal, and McGill University Health Centre among others has shown that early return to controlled exercise reduces recovery time of simple concussions and secondary symptoms of concussions in the setting of prolonged symptoms. Specifically, improvements in physical symptoms, cognition, mood, sleep, and energy levels have all been documented with the proper exercise dose at the right time. Exactly when that right time is and what dose or intensity of controlled exercise is appropriate remains a complex question. The 5th concussion consensus released in April of 2017 by BJSM has heavily supported with the ARP as early as 24-48hrs post injury. However, because everyone’s injury is different it is critical that monitored exertional testing is performed in the clinic to determine how early and at what intensity the ARP may be initiated.

How does active rehab help TBI?

The exact mechanism of how active rehab reduces the length of TBI/PCS is not completely understood. It has been proposed that aerobic exercise may increase blood flow to the brain and promote the formation of neurological connections. In TBI neurological pathways are damaged and are unable to send electrical impulses efficiently. Active rehab provides the brain with the nutrition and oxygen to build new neurological pathways and improve cognition. Furthermore, exercise is directly linked to hormones that control mood, sleep, and energy, which can impact all other PCS symptoms.

What are the steps of the ARP and when can I progress to the next step?

Active Rehab is a progression of aerobic exercise from light to maximal exertion steps 1 through 4. Patients typically increase their intensity every 1-2 weeks as long as they do not have worsening symptoms with exercise. Quicker progression may be possible under the supervision of a medical professional depending on exercise tolerance testing results. This should not be done by the patient on their own as it can increase the risk for prolonged and worsening symptoms. Each of the first 4 steps of the Active Rehab Protocol are based on a percentage of maximum heart rate (MHR) and rating of perceived exertion (**RPE**). RPE is a way of measuring physical activity intensity level. Perceived exertion is how hard you feel like your body is working. Step 5 integrates maximal exercise with functional movements to help transition athletes back to sport demands.

The 5-Step ARP

Step 1 (Light intensity): 10-12 min 5-6 days a week at a heart rate of 100-120 (50-60% MHR) or RPE of 2-3/10.

Step 2 (Moderate intensity): 12-15 min 5-6 days at a heart rate of 120-140 (60-70% MHR) or RPE of 5-6/10.

Step 3 (Vigorous intensity): 15-18 min 5-6 days at a heart rate of 140-160 (70-80% MHR) or RPE of 6-7/10

Step 4 (Maximal intensity): 20-25 min 3-5 days at a heart rate of 160-180 (80-90% MHR) or RPE of 8-9/10

Step 5 (Functional movement at maximal intensity): 30-45 min 3-5 days at maximal exertion (80-90% of MHR) performing advanced functional movement testing (multidirectional, plyometrics, proprioception, resistance, and cognitive integration). Patient cleared to participate in all non-contact and low risk sports with multidirectional movement. Duration may be gradually increased back to full. Resistance training and lifting progression to normal. Advised to avoid high risk contact sports in the red zone until full clearance by MD.

**All steps are tested in the clinic with review of both subjective symptoms and/or objective signs of dysautonomia on continuous monitoring prior to progression.*

What should I do if my symptoms worsen during Active Rehab?

Patients may experience exacerbation of their symptoms even though they had been asymptomatic with the same exertion on previous treatments. If this occurs the patient should stop aerobic exercise that day and rest. They may resume activity the next day at the same intensity. If they continue to have symptoms they should be downgraded to a lower step the next day and contact their physician. If patient become symptomatic during step 1 for consecutive days the patient should discontinue active rehab until seen by their physician.

What kind of exercise can I do for Active Rehab?

Any aerobic exercise that is low risk for repeat head trauma can be used in active rehab. For example, jogging, stationary bicycling and swimming are commonly used in active rehab. Once Step 4 is passed certain low risk sports such as swimming, track, and dance may be considered. Secondary injuries, such as knee injuries, should be considered when choosing what type of exercise can be used.

Are there any side effects for Active Rehab?

Side effects for active rehab are generally very low when the proper protocol is followed with testing prior to progression. Patients may experience acute worsening of symptoms during exercise. When this occurs the patient should follow the protocol above. Failure to follow the proper protocol may result in the worsening and prolongation symptoms.



Daily Concussion Rehabilitation Plan

All handouts for exercises available on our website: www.sparcctucson.com

Physical

Active (exertional) rehabilitation (M, T, W, Th, F, S, Su)

Step 1 Step 2 Step 3 Step 4 Step 5

Cervical rehabilitation exercises (M, T, W, Th, F, S, Su)

- 1.
- 2.
- 3.
- 4.
- 5.

Vestibular exercises (M, T, W, Th, F, S, Su)

- 1.
- 2.
- 3.

Ocular exercises (M, T, W, Th, F, S, Su)

- 1.
- 2.
- 3.
- 4.

Mental

Meditation/relaxation exercises (M, T, W, Th, F, S, Su)

- 1.
- 2.

Imagery exercises (M, T, W, Th, F, S, Su)

- 1.

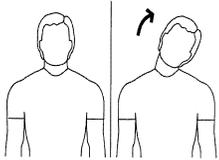
Cognitive therapy:

- 1.
- 2.

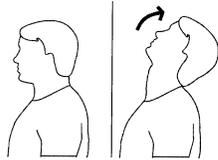
Other: _____(M, T, W, Th, F, S, Su)



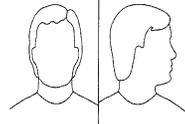
Cervical Rehabilitation Program



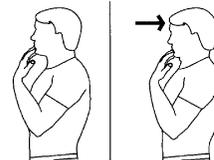
* Stand with good posture.
* Looking straight ahead, bend neck sideways, moving ear toward shoulder.



* Stand with good posture.
* Move chin up looking toward ceiling, without bending trunk.



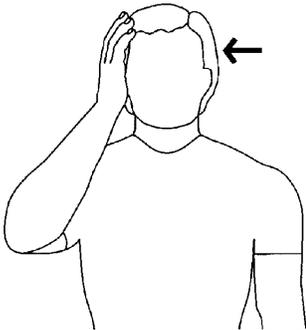
* Sit or stand, looking forward, with good posture.
* Turn head right, then left.



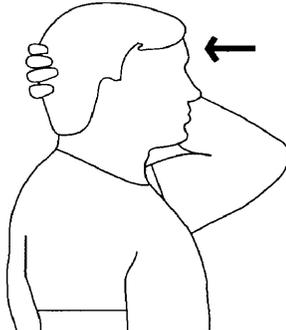
* Sit or stand, looking forward, with good posture.
* Tuck chin in, then return to start position



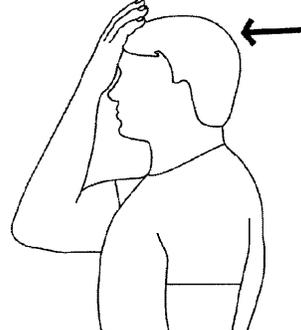
* Stand with good posture.
* Move chin down toward chest.



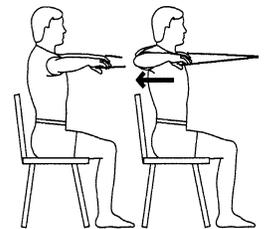
* Place palm against side of head
* Push head into palm, not allowing neck to bend.



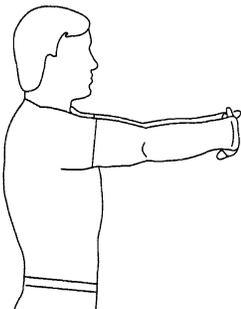
* Place palm against back of head.
* Push back of head into palm, not allowing neck to bend.



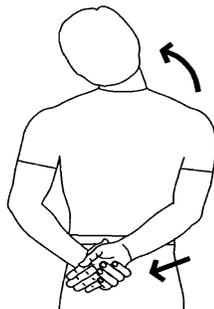
* Place palm against forehead.
* Push forehead into palm, not allowing neck to bend.



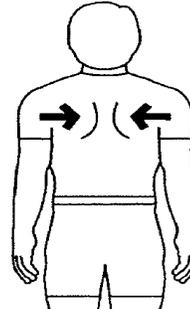
* Attach elastic to secure object.
* With elastic in hands, sit in chair with proper posture.
* Squeeze shoulder blades together as shown.



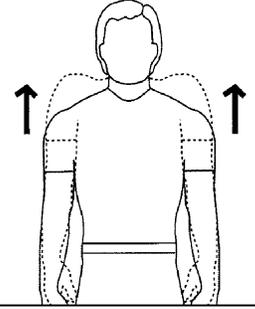
* Interlock fingers of both hands.
* Straighten arms in front, palms facing outward.
* Rounding back and separating shoulder blades.



* Place involved arm behind back, grasping with uninvolved arm.
* Bend neck sideways, as you pull involved arm to the same side.



* Stand with arms at sides.
* Squeeze both shoulder blades together.
* Relax and repeat



* Stand or sit, raise shoulders upward towards ears.
* Return to start position

References:

Children's Hospital Colorado Sports Medicine Program for young athletes
American Academy of Pediatrics
American Medical Society of Sports Medicine



Vestibulo-Ocular Exercises

BALANCE EXERCISES

Start with 3 sets of 15-30 sec daily, and gradually increase duration. *All exercises should be performed within symptom tolerance.*

1. **Stance:** Balancing on 2-1 foot, firm to soft surface, level ground to incline or uneven.
2. **Core stability exercises:** Plank, side plank, wall sit, lunges, quad rocks with rotation and airplanes
3. **Gait exercises:** Tandem walk, toe and heel walk, walk with finger to nose.

VISUAL EXERCISES

Start with 3 sets of 15 reps of each exercise daily, and gradually increase duration, number of repetitions.

1. **Side to side (Saccades):** Eyes will jump back and forth between two targets (choose small targets like a cup) without moving the head. Gradually progress speed or location of targets.
2. **Near/Far (Accommodation):** Hold onto a paper with a photo/word and have a second page on a wall in the distance. Using only their eyes, patient will look down at the image until it is in focus, then look up until image on wall is in focus.
3. **Pencil Push-ups (NPC):** Patient holds pencil in front of their nose at a distance where they see only a single pencil. Patient slowly brings the pencil closer to their nose until the pencil appears double. Hold for a few seconds and slowly move away from their nose.
4. **Dolls eye (hVOR):** With eyes fixed on a pencil rotate head as close to 90 degrees as possible while maintaining focus on the fixed pencil.

Visual/Vestibular Integration

Combine visual exercises with balance exercises above (ie; Near/Far exercise with one foot stance, or pencil push ups during lunges)

References:

Fowler Kennedy-stay active rehab
St Joseph Health Care Rehab

McCrorry P, Meeuwisse W, Johnston K, Dvorak J, Aubry M, Molloy M, Cantu R. Consensus Statement on Concussion in Sport: The 3rd International Conference on Concussion in Sport Held in Zurich, November 2008. Journal of Athletic Training. 2009; 44(4): 434-448

Coping Interventions

Coping Strategies are an important part of recovery after Traumatic Brain Injury, particularly in the developing brain. Below are some important examples of some strategies, including Concussion Action Plans, stress reduction techniques, and mental relaxation and cognitive exercises.

PROBLEM FOCUSED ENGAGEMENT

1. I've been turning to work or other activities to take my mind off not being able to go back to sports or my usual activities. (Action Plan)

To keep your mind off not being able to go back to sports, distract yourself with fun, healthy and productive activities and keep a daily and weekly planner.

2. I've been concentrating my efforts on doing something about my concussion. (Action Plan)

Concentrate on actively managing your concussion. Here are some recommendations:

- a. During your appointments with Dr. Mo, address any questions you have about concussions and the rehabilitation plan we have for you (write them down).
- b. Create a daily schedule for yourself and include the days and times of your rehabilitation exercises so you don't forget.
- c. Make a list of activities that can slow your healing or make your symptoms worse, so you're always aware of what to activities (TRIGGERS) to avoid.

Download the Concussion Action Plan and Daily Rehab Plan from our website (www.sparcctucson.com).

3. I've been trying to see my situation in a different light, to make it seem more positive (Cognitive Restructuring)

Change the way you think about your situation and challenge yourself to think about positive things that have happened. Here are some recommendations:

- a. Write down 1-2 challenges you've had in the past and what strategies you used to overcome them.

4. I've been learning to not blame myself or getting a concussion and praise myself for recovery. (Cognitive Restructuring)

Reflect on the activities you did that was a part of your recovery (rehab exercises, decreased my TV/computer/phone time, ate a healthy meal, went to bed early, etc.). Congratulate/reward yourself for accomplishing any of these tasks (no matter how small), because recovery will be gradual and it's important to pace yourself.

- a. Journaling on paper at night before bed instead of electronics
- b. Reward structure system for meeting goals
- c. Gradual approach to progress (PACING) with 10-20% a week

EMOTIONAL FOCUSED ENGAGEMENT

1. I've been accepting the fact that it has happened. (Acceptance)

Part of the healing process means accepting what has happened so you can move on to recovery. Here are some recommendations:

- a. Understanding what a concussion is, what you can do to recover, and how to prevent it from the future will make it easier for you to accept your situation.
- b. Journaling can help you process, accept, and overcome this process.

2. I've been praying or meditating. (Relaxation/Stress Reduction)

Relaxation and stress reduction techniques are essential for PCS recovery. They can also help you regulate your emotions and attention. Here are a few free, easy to use apps that we recommend:

- a. Relaxation/meditation exercises: SAM, Headspace, SMILING MIND

3. I've been getting emotional support from others (Support Structure)

Surround yourself with your close family and friends and talk to them about how you are dealing with your concussion. Discussing your feelings is an important part of healing, consider these options:

- a. Counseling
- b. Cognitive behavioral therapy (CBT)
- c. PCS support group

4. I've been saying or doing things to channel my negative emotions (Channeling)

Keeping negative feelings or negative emotions inside of you is harmful and slows down your healing process. Transform your negative feelings into something positive. Here are some recommendations:

- a. Breathing, relaxation, and Sport Imagery exercises (see SAM app above)