

Progressive Return to Activity

Following Acute Concussion/Mild Traumatic
Brain Injury: Guidance for the Rehabilitation
Provider in Deployed and Non-deployed Settings

Clinical Support Tool — January 2014



Neurobehavioral Symptom Inventory (NSI)

Please rate the following symptoms. The purpose of this inventory is to track symptoms over time. Use the 0-4 scale below to rate the symptoms. Do not attempt to score.

- 0 None** — rarely, if ever, present; not a problem at all.
- 1 Mild** — occasionally present, but it does not disrupt my activities; I can usually continue what I'm doing; doesn't really concern me.
- 2 Moderate** — often present, occasionally disrupts my activities; I can usually continue what I'm doing with some effort; I feel somewhat concerned
- 3 Severe** — frequently present and disrupts activities; I can only do things that are fairly simple or take little effort; I feel I need help.
- 4 Very Severe** — almost always present and I have been unable to perform at work, school or home due to this problem; I probably cannot function without help.

SYMPTOMS

Feeling dizzy	0	1	2	3	4
Loss of balance	0	1	2	3	4
Poor coordination, clumsy	0	1	2	3	4
Headaches	0	1	2	3	4
Nausea	0	1	2	3	4
Vision problems, blurring, trouble seeing	0	1	2	3	4
Sensitivity to light	0	1	2	3	4
Hearing difficulty	0	1	2	3	4
Sensitivity to noise	0	1	2	3	4
Numbness or tingling on parts of the body	0	1	2	3	4
Change in taste and/or smell	0	1	2	3	4
Loss or increase of appetite	0	1	2	3	4
Poor concentration, can't pay attention, easily distracted	0	1	2	3	4
Forgetfulness, can't remember things	0	1	2	3	4
Difficulty making decisions	0	1	2	3	4
Slowed thinking, difficulty getting organized, can't finish things	0	1	2	3	4
Fatigue, loss of energy, tire easily	0	1	2	3	4
Difficulty falling or staying asleep	0	1	2	3	4
Feeling anxious or tense	0	1	2	3	4
Feeling depressed or sad	0	1	2	3	4
Easily annoyed, irritable	0	1	2	3	4
Poor frustration tolerance, feeling easily overwhelmed	0	1	2	3	4

Used with permission. Cicerone, K., Kalmar, K. (1995). Persistent post-concussion syndrome: The structure of subjective complaints after mild traumatic brain injury. *The Journal of Head Trauma Rehabilitation*, 10(3), 1-17.

Neurobehavioral Symptom Inventory (NSI) completed at onset of Stage 1.

Note any symptoms rated above 1 (mild).

Rehabilitation Stage	Stage Objective	Physical Progression	Cognitive Progression	Vestibular and Balance Progression
Stage 1 Rest	Rest, limit activity to promote recovery No same day return to duty/play Provide and review with patient Stage 1 education sheet	<p style="text-align: center;">DEMANDS</p> <p>Extremely light physical activity, primarily rest although total bed rest not recommended</p> <p>Sleep as desired¹</p> <p>Abstain from alcohol</p> <p>Avoid caffeine and nicotine</p> <p>Avoid breath holding</p> <p>Rate of Perceived Exertion (RPE) Scale rating — extremely light; 6-8²</p> <p>Heart rate not to exceed 40% of age adjusted theoretical maximum heart rate³; resting HR not greater than 100</p> <p>Document resting HR and BP (baseline)</p>	<p>Extremely light cognitive activity, primarily rest</p> <p>Quiet environment with low lighting</p> <p>Ensure service member has corrective lenses and if photophobia is a problem, low light and sunglasses are advised</p>	<p>Slow and limited range of head and body movement when changing positions to limit symptoms</p> <p>Limit positions where head is below the heart</p>
Initiate Stage 2 the next day after Stage 1, if no new symptoms, no symptoms above a rating of 1 on the NSI, resting BP not to exceed 140/90, resting HR not greater than 100		<p style="text-align: center;">ACTIVITY EXAMPLES</p> <p>Basic activities of daily living</p> <p>Wear comfortable clothes</p> <p>Remain seated as needed (such as for hygiene, showering, dressing, meals)</p> <p>Walking as required — limited to easy pace, even terrain, minimal grade (such as to latrines and dining)</p> <p>No exercise</p>	<p>Extremely light, leisure activity (such as television with rest breaks each hour, short leisure reading, casual conversation)</p> <p>No video games</p> <p>No studying</p> <p>No driving</p>	<p>Movement as required for daily routine at tolerated pace</p> <p>Put on shoes while bringing foot to knee, use slip on shoes</p> <p>No bending with head below heart</p>

Increase demands systematically and progressively, observing for any change that provokes symptoms; modify intensity/duration of demands based on symptom exacerbation.

NSI completed prior to Stage 2 one day after initiation of Stage 1. Compare symptoms to Stage 1 — if no symptoms rated above 1 (mild), no increase in number or severity of symptoms, BP and HR returning to baseline, proceed to Stage 2.

Rehabilitation Stage	Stage Objective	Physical Progression	Cognitive Progression	Vestibular and Balance Progression
Stage 2 Light Routine Activity	Introduce and promote limited effort activities Provide and review with patient Stage 2 education sheet	DEMANDS		
		<p>Maximum 30 minutes of light activity to build endurance; followed by four hours of rest</p> <p>RPE Scale rating — light; 7-11²</p> <p>Heart rate not to exceed 55% of age adjusted theoretical maximum heart rate³</p> <p>Resting HR not greater than 100; resting BP not to exceed 140/90</p> <p>Limited lifting of light objects; avoid repetitive lifting</p> <p>Encourage healthy sleep habits⁴</p>	<p>Maximum 30 minutes of light cognitive activity followed by minimum 60 minutes rest between cognitive activities</p> <p>Simple, familiar activities performed one at a time</p> <p>Increasing exposure to light, and distracting noise</p>	<p>Increase amount and speed of head and body movements in daily routine</p> <p>Head movements that require turning, tilting, forward and backward bending as tolerated</p> <p>Increase shifts in visual focus from near to far and right to left</p> <p>Avoid crowded areas where jostling may occur</p>
Initiate Stage 3 the next day after Stage 2, if no new symptoms, no symptoms above a rating of 1 on the NSI, resting BP not to exceed 140/90, resting HR not greater than 100		ACTIVITY EXAMPLES		
		<p>Initiate intentional outdoor activities (mild temperature changes)</p> <p>Walking on level surfaces (treadmill)</p> <p>May wear uniform/boots</p> <p>Stationary cycling at slow pace with no tension</p> <p>Stretching</p> <p>No weight lifting</p> <p>No resistance training</p> <p>No combatives or collision sports</p>	<p>Laundry</p> <p>Leisure reading, including newspaper</p> <p>Computer use (internet navigation, casual email correspondence, etc.)</p> <p>Simple board or card games</p> <p>Assemble/disassemble weapon; clean weapon</p> <p>No video games</p> <p>No driving</p>	<p>Bending tasks (e.g., make bed; pick up objects from ground; put boots/socks on with feet on floor)</p> <p>Stair climbing as tolerated</p> <p>Ball catch and toss, indoor "basketball" (seated; tabletop) with small foam ball</p> <p>No sudden head or body movements</p>

Increase demands systematically and progressively, observing for any change that provokes symptoms; modify intensity/duration of demands based on symptom exacerbation.

NSI completed prior to Stage 3 one day after initiation of Stage 2. Compare symptoms to Stage 2 — if no symptoms rated above 1 (mild), no increase in number or severity of symptoms, BP and HR returning to baseline, proceed to Stage 3.

Rehabilitation Stage	Stage Objective	Physical Progression	Cognitive Progression	Vestibular and Balance Progression
Stage 3 Light Occupation-oriented Activity	Full body, complicated coordinated movements Provide and review with patient Stage 3 education sheet	DEMANDS		
		<p>Occupation-oriented activities for a maximum of 60 minute periods followed by four hours of rest (1:4)</p> <p>RPE Scale rating — light; 10-12²</p> <p>Heart rate not to exceed 65% of age adjusted theoretical maximum heart rate³</p> <p>Resting HR not greater than 100; resting BP not to exceed 140/90</p> <p>Avoid repetitive lifting</p> <p>Encourage healthy sleep habits⁴</p>	<p>Maximum 30 minutes of light cognitive activity followed by minimum 60 minutes rest between cognitive activities</p> <p>Simple, unfamiliar tasks or complex familiar tasks (more steps, distractions in environment)</p> <p>Activities that require one or more of the following:</p> <ul style="list-style-type: none"> ▪ Using written technical instructions ▪ Visually scanning the environment while moving <p>Increase exposure to light and noise distractions</p>	<p>Increase balance challenges in different light and terrain conditions</p> <p>Increase activities that require one or more of the following:</p> <ul style="list-style-type: none"> ▪ Clear vision during movement ▪ Faster eye, head and body movements ▪ Stooping, stretching and aiming ▪ Motion in the surrounding environment
Initiate Stage 4 the next day after Stage 3, if no new symptoms, no symptoms above a rating of 1 on the NSI, resting BP not to exceed 140/90, resting HR not greater than 100		ACTIVITY EXAMPLES		
		<p>Functional tasks requiring occasional lift and carry; lifting not to exceed 20 pounds</p> <p>May wear helmet and/or load bearing equipment (ammunition belt, suspenders, first aid kit, etc.)</p> <p>Light military tasks (cleaning equipment, organizing personal space)</p> <p>Brisk walk</p> <p>Elliptical or stair climber</p> <p>Sit-ups, pull-ups, pushups — no more than 25% of repetitions on most recent fitness test⁵</p> <p>Plank</p> <p>No valsalva</p> <p>No combatives or collision sports</p>	<p>Shopping for one item</p> <p>Narrated walk (service member identifies and verbally reports landmarks while walking on smooth terrain)</p> <p>Preventive maintenance check on vehicles</p> <p>Tabletop construction tasks that involve written/diagram instructions</p> <p>No video games</p> <p>No driving</p>	<p>Carrying objects indoors that block view of feet</p> <p>Walking on uneven terrain, steps, different lighting conditions</p> <p>Passenger in vehicle as tolerated, switch focus from near to distant landmarks</p> <p>Walking in narrow aisle or hallway</p> <p>Hand-to-hand ball toss overhead</p> <p>Stand on one foot with eyes open, then closed</p> <p>Swimming (avoid flip turns)</p> <p>Squat bender, windmill</p>

Increase demands systematically and progressively, observing for any change that provokes symptoms; modify intensity/duration of demands based on symptom exacerbation.

NSI completed prior to Stage 4 one day after initiation of Stage 3. Compare symptoms to Stage 3 — if no symptoms rated above 1 (mild), no increase in number or severity of symptoms, BP and HR returning to baseline, proceed to Stage 4.

Rehabilitation Stage	Stage Objective	Physical Progression	Cognitive Progression	Vestibular and Balance Progression
Stage 4 Moderate Activity	Increase intensity and complexity of exercise and cognitive activity Provide and review with patient Stage 4 education sheet	DEMANDS		
		Maximum 90 minutes of moderate activity RPE Scale rating — somewhat hard; 12-16 ² Heart rate not to exceed 70-85% of age adjusted theoretical maximum heart rate ³ Resting HR not greater than 100; resting BP not to exceed 140/90 Exercise and rest ratio of 1:4 (30 minute activity requires two hours of rest, 60 minute activity requires four hours rest, etc.) Occasional lifting and carrying of objects; recommend avoiding maximum weight Non-contact activities Encourage healthy sleep habits ⁴	Sustained cognitive activity for at least 20 minutes at a time, not to exceed 40 minutes and must be followed by 80 minutes cognitive rest. Cognitive activities require one or more of the following: <ul style="list-style-type: none"> ▪ Remembering to do a task at a specific time ▪ Problem solving ▪ Remembering and following verbal instructions ▪ Shifting back and forth between two tasks ▪ Scanning environment while performing a task 	Increase exercise intensity with activities that require one or more of the following: <ul style="list-style-type: none"> ▪ Improve ability to see clearly with faster head/body movements ▪ Head movements in all directions with visual tracking ▪ Total body movement, up and down (bouncing, jumping, jostling) as tolerated including riding as a passenger in a vehicle ▪ Navigating uneven terrain with reduced ability to visualize foot placement ▪ Short durations as a passenger in a vehicle
Initiate Stage 5 the next day after Stage 4, if no new symptoms, no symptoms above a rating of 1 on the NSI, resting BP not to exceed 140/90, resting HR not greater than 100		ACTIVITY EXAMPLES		
		Activities from previous stages — increase stress/duration May wear personal protective equipment (body armor, plates, mask, protectors) in progressively weighted manner Non-contact sport-related activities (shooting basketball, throwing/catching ball) Brisk hike (> 3 mph) no additional load Resistance training — 60-75% of 1 rep max ⁵ Moderate military job tasks ⁶ Tasks requiring climbing/crawling with no additional load and jogging to running as tolerated Progressive sit-up, push-up, pull-up drills (change hand/body position, speed, duration, etc.) Increase reps of sit-ups, pull-ups, push-ups — no more than 50% of repetition on most recent fitness test No combatives or collision sports	Managing appointments, medications Map reading while walking Orienteering/land navigation Grocery shopping Strategy games (chess, poker) Video games Target practice Weapons simulator Driving simulation No driving	Shooting basketball, throwing/catching ball while moving Carrying objects across rugged terrain Foolsball, golf putting, ping pong, video games Agility drills with cutting and quick direction changes Jump rope Mini trampoline Swimming with flip turns

Increase demands systematically and progressively, observing for any change that provokes symptoms; modify intensity/duration of demands based on symptom exacerbation.

NSI completed prior to Stage 5 one day after initiation of Stage 4. Compare symptoms to Stage 4 — if no symptoms rated above 1 (mild), no increase in number or severity of symptoms, BP and HR returning to baseline, proceed to Stage 5.

Rehabilitation Stage	Stage Objective	Physical Progression	Cognitive Progression	Vestibular and Balance Progression
Stage 5 Intensive Activity	Duration and intensity of activity parallels service member's typical role, function(s) and tempo Provide and review with patient Stage 5 education sheet	DEMANDS		
		Resume usual exercise routines (with exceptions below) RPE Scale rating — very hard; maximum exertion; 16 ⁻² Heart rate not to exceed 85-100% of age adjusted theoretical maximum heart rate ³ Resting HR not greater than 100; resting BP not to exceed 140/90 Encourage healthy sleep habits ⁴	Cognitive activities should be sustained for maximum of 50 minutes during exertion and/or distractions. Include activities requiring one or more of the following <ul style="list-style-type: none"> ▪ Problem solving ▪ Multi-tasking ▪ Remembering and following verbal instructions ▪ Shifting between multiple tasks ▪ Scanning the environment while performing tasks ▪ Verbally instruct someone how to perform a procedure — monitor and correct their performance 	Greater exercise intensity and dynamic balance in conditions that include one or more of the following: <ul style="list-style-type: none"> ▪ Visual challenges (smoke, low light, night vision goggles, bright lights) ▪ Rapid head and body movements ▪ Visual scanning with rapid head/eye movements while moving quickly ▪ Rapid position changes and greater jarring movements ▪ Increased duration riding as a passenger
Initiate Stage 6 the next day after Stage 5, if no new symptoms, no symptoms above a rating of 1 on the NSI, resting BP not to exceed 140/90, resting HR not greater than 100		ACTIVITY EXAMPLES		
		Participate in normal training activities Heavy military job tasks (digging, soldier carry, getting in an out of the turret of an armored vehicle, getting under a vehicle, change tire, load/unload equipment) Resistance training to maximum No combatives No contact/collision sports⁷	Communicating by signals during patrol duty Using appropriate tactics, techniques and procedures for radio communication Planning and explaining MOS specific tasks (see one, do one, teach one) Participating in typical duty day without going outside wire Participating in usual military and social activities Simulated weapons training Driving as appropriate per pre-driving screens or assessments, supervised, on road rides or simulated driving — as appropriate to MOS or civilian roles — based on available resources and environment	Navigating uneven terrain with full load Running/quick navigation in rough terrain and low-light conditions, night vision goggles, bright light Patrol duty Jump landing Simulations and virtual reality environments

Increase demands systematically and progressively, observing for any change that provokes symptoms; modify intensity/duration of demands based on symptom exacerbation.

NSI completed prior to Stage 6 one day after initiation of Stage 5. Compare symptoms to Stage 5 — if no symptoms rated above 1 (mild), no increase in number or severity of symptoms, BP and HR returning to baseline, proceed to Stage 6.

Rehabilitation Stage	Stage Objective	Physical Progression	Cognitive Progression	Vestibular and Balance Progression
Stage 6 Unrestricted Activity	Pre-injury activity level Provide follow-up guidance			

References

- Sleep as desired.** Focus on rest, allowing naps and uninterrupted sleep. Encourage an environment of low stimuli and 6-8 hours of sleep at night.
- Borg Rating of Perceived Exertion (RPE) Scale**
- Theoretical Maximum Heart Rate = 220 – age**

Heart Rate Target Chart

Age	40%	55%	65%	70%	80%	85%
15	82	114	133	144	162	174
20	80	108	130	140	160	17
25	78	107	126	136	156	165
30	76	104	123	133	152	161
35	74	101	120	129	148	159
40	72	99	117	126	144	153
45	70	96	113	122	140	148
50	68	93	110	119	136	144
55	66	91	107	115	132	140
60	64	88	104	112	128	136
65	62	85	100	108	124	132

6	No exertion at all
7 – 8	Extremely light
9	Very light exercise. For a healthy person, it is like walking slowly at his or her own pace for some minutes.
10 – 12	Light
13	Somewhat hard exercise, but it still feels OK to continue.
14 – 16	Hard (heavy)
17 – 18	Very hard. A healthy person can still go on, but he or she really has to push him- or herself. It feels very heavy, and the person is very tired.
19	Extremely strenuous exercise level. For most people this is the most strenuous exercise they have ever experienced.
20	Maximal exertion

Borg, G. (1982). *Psychophysical bases of perceived exertion, Medicine and Science in Sports and Exercise, 14(5), 377-81.*

References *continued*

4. Sleep recommendation for Stages 2-5 see “TBI Symptom Management: Healthy Sleep” (<https://dvbic.dcoe.mil/material/mild-tbi-symptom-management-fact-sheet-healthy-sleep>)
5. Percentage of repetitions on most recent fitness test, return progression and resistance training foundation based upon ACSM position. (“Progression Models in Resistance Training for Healthy Adults,” *Medicine & Science in Sports & Exercise*; March 2009, Vol. 41, Issue 3)
6. Additional exercise examples:
 - Power jump
 - Complex training drills
 - High jumper
 - Mountain climber
 - 3-5 second rush
 - Leg tuck and twist
 - Side to side knee lift
 - Front kick alternate toe touch
 - Tuck jump
 - Straddle run — forward/back
 - Half squat laterals
 - Frog jumps — forward/back
 - Shoulder roll

Military activity examples:

- Getting in and out of armored vehicle
- Road march
- Litter carry
- 3-5 second Buddy Rush
- Urban operation movements
- Operate low-recoil weapons at a range

7. Definitions of contact and collision activities.

(Rice, S., & the Council on Sports Medicine and Fitness (2008). *Medical Conditions Affecting Sports Participation*. *Pediatrics* 121(4), 841-848).

Contact sports are characterized by participants making contact with one another or inanimate objects but with less frequency and force than in collision sports.

Examples: basketball and soccer. Military examples: hand-to-hand combat, pugil sticks, headlocks/chokes, kicks, punches, bear hugs, break falls, single or double leg attacks.

Collision sports are characterized by participants purposefully hitting or colliding with each other or inanimate objects (including the ground) with great force.

Examples: football, ice hockey, men’s lacrosse and boxing. Military examples: obstacle course, rappelling, confidence course, parachute jump, free fall, diving.

NOTE:

Operational requirements may supersede these recommendations.

“Patient Activity Guidance After Concussion” handouts are available for each stage at dvbic.dcoe.mil.

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