

# **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

# 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
<b>Stage 1</b> <b>Rest</b>	Rest, limit activity to promote recovery  No same day return to duty/play  Provide and review with patient Stage 1 education sheet	Extremely light physical activity, primarily rest although total bed rest not recommended  Sleep as desired <sup>1</sup>  Abstain from alcohol  Avoid caffeine and nicotine  Avoid breath holding  Rate of Perceived Exertion (RPE) Scale rating — extremely light; 6-8 <sup>2</sup>  Heart rate not to exceed 40% of age adjusted theoretical maximum heart rate <sup>3</sup> ; resting HR not greater than 100  Document resting HR and BP (baseline)	<b>DEMANDS</b>  Extremely light cognitive activity, primarily rest  Quiet environment with low lighting  Ensure service member has corrective lenses and if photophobia is a problem, low light and sunglasses are advised	Slow and limited range of head and body movement when changing positions to limit symptoms  Limit positions where head is below the heart
<b>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</b>		<b>ACTIVITY EXAMPLES</b>  Basic activities of daily living  Wear comfortable clothes  Remain seated as needed (such as for hygiene, showering, dressing, meals)  Walking as required — limited to easy pace, even terrain, minimal grade (such as to latrines and dining)  <b>No</b> exercise	<b>ACTIVITY EXAMPLES</b>  Extremely light, leisure activity (such as television with rest breaks each hour, short leisure reading, casual conversation)  <b>No</b> video games  <b>No</b> studying  <b>No</b> driving	Movement as required for daily routine at tolerated pace  Put on shoes while bringing foot to knee, use slip on shoes  <b>No</b> bending with head below heart

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
<b>Stage 2</b> <b>Light Routine Activity</b>	Introduce and promote limited effort activities  Provide and review with patient Stage 2 education sheet	<p>Maximum 30 minutes of light activity to build endurance; followed by four hours of rest</p> <p>RPE Scale rating — light; 7-11<sup>2</sup></p> <p>Heart rate not to exceed 55% of age adjusted theoretical maximum heart rate<sup>3</sup></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 habits<sup>4</sup></p>	<p>DEMANDS</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>
<b>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</b>		<p>ACTIVITY EXAMPLES</p> <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><b>No</b> weight lifting</p> <p><b>No</b> resistance training</p> <p><b>No</b> 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><b>No</b> video games</p> <p><b>No</b> 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><b>No</b> 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
<b>Stage 3</b> <b>Light Occupation-oriented Activity</b>	Full body, complicated coordinated movements  Provide and review with patient Stage 3 education sheet	<b>DEMANDS</b>		
		<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; 10-12<sup>2</sup></p> <p>Heart rate not to exceed 65% of age adjusted theoretical maximum heart rate<sup>3</sup></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 habits<sup>4</sup></p>	<p>Maximum 30 minutes of light cognitive activity followed by minimum 60 minutes rest between cognitive activities</p> <p>Simple, unfamiliar tasks <b>or</b> 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"> <li>▪ Using written technical instructions</li> <li>▪ Visually scanning the environment while moving</li> </ul> <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"> <li>▪ Clear vision during movement</li> <li>▪ Faster eye, head and body movements</li> <li>▪ Stooping, stretching and aiming</li> <li>▪ Motion in the surrounding environment</li> </ul>
<b>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</b>		<b>ACTIVITY EXAMPLES</b>		
		<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 test<sup>5</sup></p> <p>Plank</p> <p><b>No</b> valsalva</p> <p><b>No</b> 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><b>No</b> video games</p> <p><b>No</b> 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
<b>Stage 4</b> <b>Moderate Activity</b>	<p>Increase intensity and complexity of exercise and cognitive activity</p> <p>Provide and review with patient Stage 4 education sheet</p>	<b>DEMANDS</b>		
		<p>Maximum 90 minutes of moderate activity RPE Scale rating — somewhat hard; 12-16<sup>2</sup></p> <p>Heart rate not to exceed 70-85% of age adjusted theoretical maximum heart rate<sup>33</sup></p> <p>Resting HR not greater than 100; resting BP not to exceed 140/90</p> <p>Exercise and rest ratio of 1:4 (30 minute activity requires two hours of rest, 60 minute activity requires four hours rest, etc.)</p> <p>Occasional lifting and carrying of objects; recommend avoiding maximum weight</p> <p>Non-contact activities</p> <p>Encourage healthy sleep habits<sup>4</sup></p>	<p>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:</p> <ul style="list-style-type: none"> <li>Remembering to do a task at a specific time</li> <li>Problem solving</li> <li>Remembering and following verbal instructions</li> <li>Shifting back and forth between two tasks</li> <li>Scanning environment while performing a task</li> </ul>	<p>Increase exercise intensity with activities that require one or more of the following:</p> <ul style="list-style-type: none"> <li>Improve ability to see clearly with faster head/body movements</li> <li>Head movements in all directions with visual tracking</li> <li>Total body movement, up and down (bouncing, jumping, jostling) as tolerated including riding as a passenger in a vehicle</li> <li>Navigating uneven terrain with reduced ability to visualize foot placement</li> <li>Short durations as a passenger in a vehicle</li> </ul>
		<b>ACTIVITY EXAMPLES</b>		
		<p>Activities from previous stages — increase stress/duration</p> <p>May wear personal protective equipment (body armor, plates, mask, protectors) in progressively weighted manner</p> <p>Non-contact sport-related activities (shooting basketball, throwing/catching ball)</p> <p>Brisk hike (&gt; 3 mph) no additional load</p> <p>Resistance training — 60-75% of 1 rep max<sup>5</sup></p> <p>Moderate military job tasks<sup>6</sup></p> <p>Tasks requiring climbing/crawling with no additional load and jogging to running as tolerated</p> <p>Progressive sit-up, push-up, pull-up drills (change hand/body position, speed, duration, etc.)</p> <p>Increase reps of sit-ups, pull-ups, push-ups — no more than 50% of repetition on most recent fitness test</p> <p><b>No</b> combatives or collision sports</p>	<p>Managing appointments, medications</p> <p>Map reading while walking</p> <p>Orienteering/land navigation</p> <p>Grocery shopping</p> <p>Strategy games (chess, poker)</p> <p>Video games</p> <p>Target practice</p> <p>Weapons simulator</p> <p>Driving simulation</p> <p><b>No</b> driving</p>	<p>Shooting basketball, throwing/catching ball while moving</p> <p>Carrying objects across rugged terrain</p> <p>Foosball, golf putting, ping pong, video games</p> <p>Agility drills with cutting and quick direction changes</p> <p>Jump rope</p> <p>Mini trampoline</p> <p>Swimming with flip turns</p>
	<p><b>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</b></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 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
<b>Stage 5</b> <b>Intensive Activity</b>	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		
		<p>Resume usual exercise routines (<b>with exceptions below</b>)</p> <p>RPE Scale rating — very hard; maximum exertion; 16<sup>2</sup></p> <p>Heart rate not to exceed 85-100% of age adjusted theoretical maximum heart rate<sup>3</sup></p> <p>Resting HR not greater than 100; resting BP not to exceed 140/90</p> <p>Encourage healthy sleep habits<sup>4</sup></p>	<p>Cognitive activities should be sustained for maximum of 50 minutes during exertion and/or distractions. Include activities requiring one or more of the following</p> <ul style="list-style-type: none"> <li>▪ Problem solving</li> <li>▪ Multi-tasking</li> <li>▪ Remembering and following verbal instructions</li> <li>▪ Shifting between multiple tasks</li> <li>▪ Scanning the environment while performing tasks</li> <li>▪ Verbally instruct someone how to perform a procedure — monitor and correct their performance</li> </ul>	<p>Greater exercise intensity and dynamic balance in conditions that include one or more of the following:</p> <ul style="list-style-type: none"> <li>▪ Visual challenges (smoke, low light, night vision goggles, bright lights)</li> <li>▪ Rapid head and body movements</li> <li>▪ Visual scanning with rapid head/eye movements while moving quickly</li> <li>▪ Rapid position changes and greater jarring movements</li> <li>▪ Increased duration riding as a passenger</li> </ul>
<b>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</b>		ACTIVITY EXAMPLES		
		<p>Participate in normal training activities</p> <p>Heavy military job tasks (digging, soldier carry, getting in and out of the turret of an armored vehicle, getting under a vehicle, change tire, load/unload equipment)</p> <p>Resistance training to maximum</p> <p><b>No combatives</b></p> <p><b>No contact/collision sports<sup>7</sup></b></p>	<p>Communicating by signals during patrol duty</p> <p>Using appropriate tactics, techniques and procedures for radio communication</p> <p>Planning and explaining MOS specific tasks (see one, do one, teach one)</p> <p>Participating in typical duty day without going outside wire</p> <p>Participating in usual military and social activities</p> <p>Simulated weapons training</p> <p><b>Driving as appropriate</b> 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</p>	<p>Navigating uneven terrain with full load</p> <p>Running/quick navigation in rough terrain and low-light conditions, night vision goggles, bright light</p> <p>Patrol duty</p> <p>Jump landing</p> <p>Simulations and virtual reality environments</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 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
<b>Stage 6</b> <b>Unrestricted Activity</b>	Pre-injury activity level Provide follow-up guidance			

## References

- 1. 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.
- 2. Borg Rating of Perceived Exertion (RPE) Scale**

<b>6</b>	<b>No exertion at all</b>
<b>7 – 8</b>	<b>Extremely light</b>
<b>9</b>	<b>Very light</b> exercise. For a healthy person, it is like walking slowly at his or her own pace for some minutes.
<b>10 – 12</b>	<b>Light</b>
<b>13</b>	<b>Somewhat hard</b> exercise, but it still feels OK to continue.
<b>14 – 16</b>	<b>Hard</b> (heavy)
<b>17 – 18</b>	<b>Very hard.</b> 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.
<b>19</b>	<b>Extremely strenuous</b> exercise level. For most people this is the most strenuous exercise they have ever experienced.
<b>20</b>	<b>Maximal exertion</b>

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

- 3. Theoretical Maximum Heart Rate = 220 – age**

Heart Rate Target Chart

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

## References *continued*

4. Sleep recommendation for Stages 2-5 see “TBI Symptom Management: Healthy Sleep” ([dvbic.dcoe.mil](http://dvbic.dcoe.mil))
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](http://dvbic.dcoe.mil).*

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2345 Crystal Drive, Suite 120  
Arlington, Virginia 22202  
800-510-7897

1335 East West Highway, 9<sup>th</sup> Floor  
Silver Spring, Maryland 20910  
301-295-3257



**DVBIC**  
DEFENSE AND VETERANS  
BRAIN INJURY CENTER

**dvbic.dcoe.mil**

1335 East-West Highway,  
Suite 6-100  
Silver Spring, Maryland 20910  
800-870-9244