MANAGEMENT STRATEGIES FOR THE CONCUSSED ATHLETE

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SEMINAR OBJECTIVES

- Understand and implement at least 2 balance assessments
  - Capable of being done in the training room
  - Require minimal equipment
- Implement at least 2 new balance strategies
  - Increase the challenge of the activity
  - Help determine return to ice for the injured player
- Understand options for assessing exercise level and physiologic recovery
- Recognize symptom overlap of mTBI and depression
SCAT 3

- Sport Concussion Assessment Tool Rev. 3
  - Assess cognitive function
  - Uses postural control to assess motor function.

- Pro: Great for sideline and serial testing

- Con: Static test. Scores will improve regardless of intervention

- Suggestion: add dynamic testing to guide treatment progression
WORKSHOP 1 OBJECTIVES

- Introduce a dynamic balance test
- Discuss other measures to test return to baseline for the athlete
- Discuss and practice treatment strategies for progressing balance challenges and sport specific tasks
WORKSHOP 1:
TESTING TO GUIDE TREATMENT

- High-level Mobility Assessment Tool (HiMat)
- Army Physical Fitness Test (APFT)
- Pre-season NHL team specific baseline tests
  - i.e. shuttle run times, push ups, wall sits
# HiMAT: High Level Mobility Assessment Tool

**Date**

**Date of Accident**

**Diagnosis**

**Affected Side** - Left / Right

**Patient ID**

**Label**

<table>
<thead>
<tr>
<th>Item</th>
<th>Performance</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk</td>
<td>sec</td>
<td>&gt;6.6</td>
<td>5.4-6.6</td>
<td>4.3-5.3</td>
<td>&lt;4.3</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Walk Backward</td>
<td>sec</td>
<td>&gt;13.3</td>
<td>8.1-13.3</td>
<td>5.8-8.0</td>
<td>&lt;5.8</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Walk On Toes</td>
<td>sec</td>
<td>&gt;8.9</td>
<td>7.0-8.9</td>
<td>5.4-6.9</td>
<td>&lt;5.4</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Walk Over Obstacle</td>
<td>sec</td>
<td>&gt;7.1</td>
<td>5.4-7.1</td>
<td>4.5-5.3</td>
<td>&lt;4.5</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Run</td>
<td>sec</td>
<td>&gt;2.7</td>
<td>2.0-2.7</td>
<td>1.7-1.9</td>
<td>&lt;1.7</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Skip</td>
<td>sec</td>
<td>&gt;4.0</td>
<td>3.5-4.0</td>
<td>3.0-3.4</td>
<td>&lt;3.0</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Hop Forward (Affected)</td>
<td>sec</td>
<td>&gt;7.0</td>
<td>5.3-7.0</td>
<td>4.1-5.2</td>
<td>&lt;4.1</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Bound (Affected)</td>
<td>cm</td>
<td>&lt;80</td>
<td>80-103</td>
<td>104-132</td>
<td>&gt;132</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Bound (Less-Affected)</td>
<td>cm</td>
<td>&lt;82</td>
<td>82-105</td>
<td>105-129</td>
<td>&gt;129</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Up Stairs Dependent (Rail OR not reciprocal: if not, score 5 and rate above)</td>
<td>sec</td>
<td>&gt;22.8</td>
<td>14.6-22.8</td>
<td>12.3-14.5</td>
<td>&lt;12.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up Stairs Independent (No rail AND reciprocal: if not score 0 and rate above)</td>
<td>sec</td>
<td>&gt;9.1</td>
<td>7.6-9.1</td>
<td>6.8-7.5</td>
<td>&lt;6.8</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Down Stairs Dependent (Rail OR not reciprocal: if not score 5 and rate below)</td>
<td>sec</td>
<td>&gt;24.3</td>
<td>17.6-24.3</td>
<td>12.8-17.5</td>
<td>&lt;12.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Down Stairs Independent (No rail AND reciprocal: if not score 0 and rate above)</td>
<td>sec</td>
<td>&gt;8.4</td>
<td>6.6-8.4</td>
<td>5.8-6.5</td>
<td>&lt;5.8</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**Subtotal**

**Total HiMAT Score** /54

Please notify Gavin Williams at gavin@neuro-solutions.net or gavin.williams@cpworth.org.au so that the use of the HiMAT can be tracked.
DYNAMIC BALANCE AND GAIT STRATEGIES

- Basic balance and walking progression
- Stable to Unstable Surface
- Head Shakes, Head Turns
- Walking with Head Turns
- Walking Forwards, Backwards, Figure of 8’s
- Quiet Hallway to Busy Hallway
SUGGESTIONS

Unstable Environments
- Head Turns: horizontal and vertical
- Quiet to busy areas
- Outdoors
- Shopping
- Optokinetic backgrounds: checkerboard, moving background, game tapes

Unstable Surfaces
- Grass
- Foam
- Mini Trampoline
- Bosu Ball
- Indo Board
- Treadmill
- Foot on Ball
- Ice
# VESTIBULAR REHAB PROGRESSIONS

<table>
<thead>
<tr>
<th>Modifier</th>
<th>Choices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posture</td>
<td>1: Sitting, 2: Standing, 3: Walking, Not applicable/Not specified (NA/NS)</td>
</tr>
<tr>
<td>Surface</td>
<td>1: Level, 2: Foam, 3: Uneven, 4: Obstacle, 5: Stairs, 6: Ramps, NA/NS</td>
</tr>
<tr>
<td>Base of support</td>
<td>1: Feet-apart, 2: Feet-together, 3: Semi-tandem, 4: Tandem, NA/NS</td>
</tr>
<tr>
<td>Trunk position</td>
<td>1: Upright, 2: Leaning, 3: Rotated, NA/NS</td>
</tr>
<tr>
<td>Arm position</td>
<td>1: Weight bearing, 2: Close to body, 3: Away from body, 4: Reaching, 5: Carrying, 6: Picking up objects, 7: Juggling, NA/NS</td>
</tr>
<tr>
<td>Head movement direction</td>
<td>1: Still, 2: Yaw, 3: Pitch, 4: Roll, NA/NS</td>
</tr>
<tr>
<td>Direction of whole body movements</td>
<td>1: Anterior–posterior, 2: Medial–lateral, 3: Multi-directional, NA/NS</td>
</tr>
<tr>
<td>Visual input</td>
<td>1: Eyes closed, 2: Eyes open, 3: Complex patterns, NA/NS</td>
</tr>
<tr>
<td>Cognitive dual task</td>
<td>1: Yes, 2: No</td>
</tr>
<tr>
<td>Special circumstances</td>
<td>For example, note if the VORx1 exercise was performed with a near or far target</td>
</tr>
</tbody>
</table>
SPORT SPECIFIC TASKS

- Not necessarily hockey skills initially to avoid frustration
- Activities where the eyes and hands are moving in the opposite direction of the feet
  - Utilize lacrosse, tennis, soccer skills for carry over
    - Jumping, single stable limb
- Progress to performing tasks with increasing speed and more demanding environments
- Gradually work in hockey skills
SPEED AND VARIABILITY OF MOVEMENT

- Needed for return to play

- Off ice:
  - Sweet Hands
  - Stick handling while walking
  - Frisbee / Frisbee golf
  - Tennis ball against a wall
  - Catch
  - Hacky Sack
  - Lacrosse catch against a wall or with teammates

- Begin ice drills:
  - Stick handling
  - Shooting
  - Work up to passing drills

- Add cognitive challenges and speed of movement
Post Concussion rehab program 3-5 x/ day
Why do concussion rehab at the training room?

- Guide and progress difficulty of program
- Rule out other symptoms like BPPV
- Facilitate nutrition, sleep patterns
- Maintain the Athlete’s role on team
KEEP IT INTERESTING AND CHALLENGING

- Makes it more enjoyable for you and the athlete
- Lessens risk of depressive symptomology
- Utilize skills from other sports
- Involve other teammates. You have multiple demands on you and the concussed athlete needs to stay engaged with the team
WORKSHOP 2 OBJECTIVES

- Recognize symptom overlap of mTBI and depression
- Understand options for assessing exercise level and physiologic recovery
**WORKSHOP 2**
**DO I STILL HAVE TO REST?**

- Guiding return to sport and limiting depression side effects of concussion

<table>
<thead>
<tr>
<th>Stage of Rehab</th>
<th>Functional Exercise to be attempted</th>
<th>Objectives to meet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No Activity</td>
<td>Complete physical and cognitive rest</td>
<td>Recovery – remain at stage 1 until symptom free</td>
</tr>
<tr>
<td>2. Light aerobic exercise*</td>
<td>Walking, swimming, stationary cycling (Intensity &lt;70% of max heart (HR) rate) – no resistance training</td>
<td>Increase HR</td>
</tr>
<tr>
<td>3. Sport-specific exercise</td>
<td>Skating, running, jumping (No head impact activities)</td>
<td>Add sport-specific movement</td>
</tr>
<tr>
<td>4. Non-contact training drills</td>
<td>Progress to more complex training drills (passing, catching, dribbling, stick-handling etc.); May begin progressive resistance training</td>
<td>Exercise, coordination, and cognitive load – challenging multiple systems</td>
</tr>
<tr>
<td>5. Full contact practice**</td>
<td>Following medical clearance, participate in normal training activities</td>
<td>Restore confidence and assess functional skills</td>
</tr>
<tr>
<td>6. Return to play</td>
<td>Normal Game Play</td>
<td></td>
</tr>
</tbody>
</table>

Table 4 (Article 8)
Exercise testing can determine safe HR for exercise without exacerbating symptoms.

"Prolonged rest, especially in athletes can lead to physical deconditioning, metabolic disturbances and secondary symptoms such as fatigue and reactive depression."\(^5\)

Loss of occupational or family roles may lead to depressive symptomology\(^3\)

Depressed mood and fatigue are commonly observed in individuals deprived of usual exercise activities.
## Symptom Overlap

<table>
<thead>
<tr>
<th>Symptom</th>
<th>mTBI</th>
<th>PTSD</th>
<th>Depression</th>
<th>Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive slowing</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Memory difficulties</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Concentration</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Sleep problems</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Noise sensitivity</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Appetite changes</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Irritable</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Fatigue</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Headaches</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>
## LOSS OF IDENTITY AND ACTIVITY

<table>
<thead>
<tr>
<th>Negative Symptoms or Side Effects of Injury</th>
<th>Positives of Maintaining Role as Teammate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irritable</td>
<td>Maintains interactions with peers, gives family a “break”</td>
</tr>
<tr>
<td>Too Much Screen Time</td>
<td>Schedule, time to check in and complete exercises</td>
</tr>
<tr>
<td>Poor Nutritional Habits</td>
<td>Team Training Table or out to eat with peers</td>
</tr>
<tr>
<td>Altered Sleep / Wake Cycle</td>
<td>Regular activity and check ins with the teams</td>
</tr>
</tbody>
</table>
ASSESSMENT OPTIONS: GUIDING RETURN TO PLAY

- Balke Exercise Treadmill Test
- Cycle Ergometry
- ARMY PFT or NHL Team specific pre season requirements
“The most commonly reported symptoms indicating that the concussion is not resolved are worsening headache and/or a sensation that the head feels full. A comparison of the HR at the point of symptom exacerbation to the athletes theoretical maximum HR gives you a good indication of how close the athlete is to full recovery.”

5
**BALKE TREADMILL TEST**

- Treadmill 3.3 mph and at 0.0% Incline
- 1 minute: grade increased to 2.0%
- Start of minute 3 and each minute after, increase grade by 1.0%
- Every minute assess HR, RPE and Symptoms
- B/P every 2 minutes
- Terminate test when concussion symptoms are exacerbated
- Monitor at conclusion for safety
CYCLE ERGOMETRY

- 2 min. warm up 50-60 rpm, load 40 W
- 10 min 80-90 rpm at constant load of 1.5W/kg body weight
- High intensity intervals
- 40 sec at 4.7 W/kg  90-100 rpm
- 20 sec free pedal at 30 W
- 20 sec rest
- Record the number of high intensity bouts
- Assess HR and symptoms
MAINTAINING LIFE ROLES

- Cardiovascular exercise facilitates rest and normal wake / sleep patterns
- Coping mechanism for stress and pain
- The training room allows them to remain hockey players
- Gives purpose to their teammate who assists with transportation, moral support or exercise
BECAUSE IT’S THE CUP
Dayna Geiger, DPT
- VAMC Salt Lake City, UT
Email: dayna_geiger@hotmail.com
Cell: 801-867-3704
Balance Rehabilitation should occur at home and in the training room.

Balance rehabilitation includes sports specific training and prepares the athlete for returning to the game.

Cardiovascular exercise is an important part of concussion management following a short period of rest.

It is vital to maintain a player’s role as athlete, teammate and provider to limit other symptoms.

2. KM Guskiewicz, SE Ross, and SW Marshall, “Why the Clinical Test for Sensory Integration of Balance (CTSIB) for concussion baseline balance testing?” in J Athl Train (2001)

3. NeuroCom, “Sensory Organization Test (SOT),” 1

REFERENCES


