PHYSIOTHERAPY GUIDED REHABILITATION OF CONCUSSION

The following table outlines the five systems that should be considered when designing a rehabilitation plan for an athlete recovering from concussion and is based on the graded return to sport framework (GRTSF) for **advanced care settings**. The systems are closely interconnected and care must be taken to avoid over stimulation, particularly early in the GRTSF. Failure to progress through the graded return to sport as expected requires referral to appropriate member of the clinical management team (or CMT) for subsequent review. Athletes need to be assessed individually as the requirements for every sport and athlete are different and no two concussions present the same. The below is an example and should not be used as a recipe. Some considerations are included at each stage that can challenge/be useful for practitioners and coaches.

Athletes 18 years and under can utilise this guide but MUST follow the GRTSF for community and youth, specifically the 14 days symptom free (at rest) and 21 days mimimum before returning to competitive contact.

<table>
<tr><th>Autonomic</th><th>Cervical</th><th>Vestibular</th><th>Visual</th><th>Cognitive</th></tr>
<tr><td>Activities of daily living</td><td>Full pain-free range of motion (active and passive)
Physiotherapy assessment will guide rehabilitation but can involve passive, active and active-assisted range of motion exercises</td><td rowspan="2">Activities of daily living</td><td>Activities of daily living</td><td>Activities of daily living</td></tr>
<tr><td>Steady-state exercise
Up to 60% HRmax with minimal movement of head
e.g. moderate walk over flat ground or stationary bike seated only</td><td>Address referred pain and headaches
Physiotherapist-led treatment as appropriate for each individual. May include manual therapy, exercise therapy</td><td colspan="2">Gradual resumption of school or work
e.g. depending on symptoms begin with several hours or part days at work or school
<u>Consider:</u>
Decrease work of visual system by sitting at the front of classrooms, scheduling short periods of time at the computer. Avoid watching fast paced or complex visuals such as training sessions, videos, movies, etc</td></tr>
<tr><td colspan="5">Healthcare practitioner review recommended at day 3-4 to include SCOAT6</td></tr>
<tr><td>Continue steady-state exercise
(as above)</td><td>Deep neck flexion exercises initiated
Motor control and stability exercises can be prescribed in seated, supine or prone positions depending on individual requirements.
<u>Consider:</u>
Sport-specific positions for head/neck such as:
- 4-point kneeling for rugby, cycling
- prone holds with rotation for swimming, gymnastics
- seated for waterpolo, artistic swimming
- standing multidirectional for AFL</td><td>Continue activities of daily living
(as above)</td><td>Continue gradual resumption of school or work
(as above)

Hand-eye coordination with minimal head movements
e.g.
- Ball drills against wall or with partner from in front only
- Steady running at 50-60% max speed
- Swimming with kickboard and snorkel
<u>Consider:</u>
Speed, height, type of ball (if using) and predictability of activity performed. Start in quiet environment with bland visual background to avoid exacerbation of symptoms due to visual and cognitive loads</td><td>Continue gradual resumption of school or work
Progressions will naturally increase as rehabilitation in other areas progresses. If complications and impairments in cognitive function are recognised during rehabilitation referral to a HCP* is recommended for assessment. If there are known impairments in cognitive function post-concussion close communication with the managing doctor is highly recommended for an integrated management approach and best outcomes to occur</td></tr>
<tr><td>Progress steady-state exercise
Maintain single plane of movement, e.g. straight line running, etc.
Incremental increase in heart rate up to 80% HRmax e.g. 5min increments @50%, 60%, 65%, 70% Hrmax
e.g. start with stationary seated bike or walking and progress to sport-specific mediums such as:
- Running (straight line only)
- Swimming (minimal to no rotation, no tumbling at ends of pool)
- Cycling return to road riding (bike paths or quiet roads)
<u>Consider:</u>
Concussive symptoms may be exacerbated by environments that challenge the visual or vestibular system. These can include: noise, lights, movements in athlete's visual background, team/squad training, uneven surfaces, etc.</td><td>Cervical sensorimotor exercises
e.g. joint position training seated with eyes open
<u>Consider:</u>
Progress difficulty with eyes closed or standing on firm and soft surfaces.
Visual backgrounds, sport-specific environments can increase complexity such as:
- Seated on exercise ball
- Eggbeater position on plinth and progressing to pool
- 4-point kneeling
- Prone</td><td colspan="2">Controlled non-reactive hand-eye coordination with head movements
e.g.
- Ball drills against wall or with partner from various directions to encourage head rotations, up and downs, etc.
- Increase running pace to add greater visual input, run around track
- Swimming strokes with usual movement patterns (no tumbling)
<u>Consider:</u>
Complex visual backgrounds, busy environments such as sideline of team/squad training, crowd noises, lights can challenge visual and cognitive system but may also exacerbate symptoms</td><td>Introduce dual-tasks
e.g.
- Count numbers out loud whilst doing ball skills
- Complete multiplications on demand whilst completing steady state exercise, such as stationary bike or walking</td></tr>
<tr><td colspan="5">Do any activities bring on or exacerbate symptoms? Y N
Can athlete complete 1-minute of sport-specific skills with head movement without ANY symptoms? Y N</td></tr>
<tr><td>Continue progressing steady-state exercise
(as above)</td><td>Introduce resistance training
Build strength loads back to squad/individual requirements. Include specific cervical flexor and extensor strengthening.
<u>Consider:</u>
Re-integration with squad/team during S&C sessions to challenge visual, vestibular, and cognitive loads as appropriate</td><td colspan="2">Continue controlled non-reactive hand-eye coordination with head movements
(as above)

More complex hand-eye (or foot-eye) coordination involving head and body movements
e.g.
- Ball drills involving 90degree rotations progressing to 360deg
- Introduce small volumes of tumbling at ends of pool and diving from blocks
- Starting from blocks and reacting to start signal
- Shooting practice from greater distances (waterpolo, soccer, AFL, archery, shooting, basketball, etc.)
<u>Consider:</u>
Volume of skills being introduced. Sport specific coordination skills, e.g. groundballs, high balls, cycling with visual input e.g. simulator and increase complexity by performing tasks in busy training environments and progressing pace of tasks.</td><td>See above for details</td></tr>
<tr><td>Interval training
- increase run speeds to 90% with straight-line run-throughs, flying 60s, etc.
- swimming interval sets
<u>Consider:</u>
Ensure time allocated between sets for recovery and any potential symptom provocation</td><td>Continue resistance training
(as above)</td><td colspan="2">Hand-eye (or foot/eye) coordination whilst moving
e.g.
- walk-through ball skills such as walking dribbling, partner passing whilst walking
- progress skills involving rotations, twisting, precision, e.g. gymnastics, diving, artistic swimming, archery, shooting
<u>Consider:</u>
Environment of activities and increase complexity with multiple balls and/or players, performing multiple skills consecutively, volume, noise, lights, etc</td><td></td></tr>
<tr><td>Agility and multi-directional activity
e.g.
- incorporte planned or athlete-led directional changes into running
- pool sessions with unrestricted tumbling
- progressively return to busier roads on bike
<u>Consider:</u>
Progress to reactionary change of directions to increase cognitive load. Use speed, volume, sport specific skills to increase challenge</td><td></td><td colspan="2">Controlled sport-specific activities
e.g. Controlled team non-contact or high-risk training activities such as:
- kicking or hand-balling drills (No match simulation drills)
- 5v0 drills
<u>Consider:</u>
Volume if all other parameters are back to full training capacity. Number of athletes, noise, external and internal stress may increase cognitive and visual load</td><td></td></tr>
<tr><td>Build training volumes and sport-specific requirements
Incremental increase to meet usual training volumes for squad/individual
<u>Consider:</u>
All systems being rehabilitated simultaneously</td><td></td><td colspan="2">Reactive sport-specific activities
e.g. Uncontrolled non-contact training or physiotherapist-led reactive drills. involving:
- Kick, chase, marking skills
- Rebounding drills
- Uncontrolled terrains
<u>Consider:</u>
Vary reactionary component with location, timing or skill required. Increase complexity with multiple balls and/or players, competition against teammates, noise, lights, etc</td><td></td></tr>
<tr><td colspan="5">Healthcare practitioner review for clearance to return to contact and high-risk activities
When symptom-free for at least 10 days</td></tr>
<tr><td colspan="5">Full Training</td></tr>
<tr><td colspan="5">Competition or Match Simulation</td></tr>
<tr><td colspan="5">Match or Competition Play</td></tr>
</table>

*HCP is AHPRA registered healthcare practitioner with appropriate training and experience in concussion assessment and management

ASC37382