



OPEN ACCESS

Concussion in para sport: the first position statement of the Concussion in Para Sport (CIPS) Group

Richard Weiler ^{1,2,3} Cheri Blauwet ^{4,5} David Clarke,⁶ Kristine Dalton ⁷,
Wayne Derman ^{8,9} Kristina Fagher ¹⁰ Vincent Gouttebargé ^{1,11}
James Kissick ^{12,13} Kenneth Lee ¹⁴ Jan Lexell ¹⁰ Peter Van de Vliet ¹⁵,
Evert Verhagen ¹ Nick Webborn ¹⁶ Osman Hassan Ahmed ^{3,17,18}

► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/bjsports-2020-103696>).

For numbered affiliations see end of article.

Correspondence to

Professor Evert Verhagen,
Department of Public
and Occupational Health,
Amsterdam UMC, Amsterdam,
Noord Holland, The Netherlands;
e.verhagen@amsterdamumc.nl

Accepted 4 March 2021

ABSTRACT

Concussion is a frequent injury in many sports and is also common in para athletes. However, there is a paucity of concussion research related to para sport, and prior International Concussion in Sport (CIS) consensus papers have not substantively addressed this population. To remedy this and to improve concussion care provided to para athletes, the concussion in para sport (CIPS) multidisciplinary expert group was created. This group analysed and discussed in-depth para athlete-specific issues within the established key clinical domains of the current (2017) consensus statement on CIS. Due to the onset of the COVID-19 pandemic, the group held all meetings by video conferencing. The existing Sport Concussion Assessment Tool 5 (SCAT5) for the immediate on-field and office-based off-field assessment of concussion was evaluated as part of this process, to identify any para athlete-specific concerns. Regular participation and periodic health examinations are essential to determine a baseline reference point for concussion symptoms but pose additional challenges for the interpreting clinician. Further considerations for concussion management for the para athlete are required within the remove, rest, reconsider and refer consensus statement framework. Considering return to sport (RTS), the 2017 CIS consensus statement has limitations when considering the RTS of the para athlete. Case-by-case decision making related to RTS following concussion is imperative for para athletes. Additional challenges exist for the evaluation and management of concussion in para athletes. There is a need for greater understanding of existing knowledge gaps and attitudes towards concussion among athlete medical staff, coaches and para athletes. Future research should investigate the use and performance of common assessment tools in the para athlete population to better guide their clinical application and inform potential modifications. Concussion prevention strategies and sport-specific rule changes, such as in Para Alpine Skiing and Cerebral Palsy Football, also should be carefully considered to reduce the occurrence of concussion in para athletes.

INTRODUCTION

Concussion prevention, recognition, assessment and management have been topics of much discussion and debate across all major global sports, including para Sports. Injury surveillance data from the most recent summer and winter paralympic games, showing high rates of injuries to the head and face in football 5-a-side (blind football), Para

Alpine Skiing, Para Ice Hockey and Para Snowboarding, demonstrate the need for this discussion and debate.^{1,2} At the Rio 2016 Summer Paralympic Games, no concussions were reported by team physicians in the injury reporting survey, despite several incidents across different sports where athletes were observed to suffer a blow to the head, followed by unsteady gait and reports of significant injuries to the head and face.³ Recently, a study of clinicians working at the 2015 Cerebral Palsy (CP) Football World Championships showed that clinicians' overall knowledge around concussion was sound, but their methods for recognition and management were highly variable.⁴ Study participants recognised an urgent need for expert clinical guidance specific to this population of athletes. Aside from a wider need for concussion education, clinicians face difficulties when applying existing concussion assessment and management guidelines to para athletes.

Various terminology has been used within para sport and our paper will align with the Para sport translation of the International Olympic Committee (IOC) consensus on the recording and reporting of data for injury and illness in sport.⁵ Accordingly 'a para athlete is the International Paralympic Committee's term for a sportsperson with an impairment and these terms will be used in this consensus statement as they apply to all athletes with impairment partaking in sport.' The World Health Organization (WHO) defines disability as 'any restriction or lack of ability to perform an activity in the manner or within the range considered normal for a human being,' wherein disability is considered the result of an impairment.⁵⁻⁷

While tools assessing brain function (eg, Sport Concussion Assessment Tool 5 (SCAT5) and neuro-cognitive tests) are widely acknowledged to be helpful following concussion, these tools are neither validated nor applicable in some respects within a para sport population. Significant differences were shown between baseline SCAT3 scores for footballers with and without impairment.⁸ These differences, among others, need to be recognised and considered, in order to create concussion guidelines that are specific to the wide variety of impairments noted in the growing number of athletes living with impairment. Within previous iterations of the consensus statements from the Concussion in Sport Group (CISG),⁹ there has been no consideration of the specific issues faced by para athletes, which may



© Author(s) (or their employer(s)) 2021. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: Weiler R, Blauwet C, Clarke D, et al. *Br J Sports Med* Epub ahead of print: [please include Day Month Year]. doi:10.1136/bjsports-2020-103696

reflect the lack of concussion-related research that focuses on para athletes. Despite a paucity of research, the concussion issues faced by para athletes and their support staff are of concern and therefore specific recommendations for standards of care are needed.

METHODS

The aim of the Concussion in Para Sport (CIPS) group was to develop specific recommendations and guidance related to para athletes and their attending medical professionals in the event that a para athlete sustains a suspected concussion. The Concussion Recognition tool 5 (CRT5), SCAT5 and the CIS 2017 consensus statement lack any specific guidance focusing on the para athlete. Our analysis will focus on the SCAT5, which can be used by physicians and licensed healthcare professionals for athletes aged 13 years or older and encompasses immediate on field assessment and office based off-field assessment of suspected concussion.

An initial multidisciplinary panel of experts was selected who are academically and/or clinically experienced in para sport or concussion in both para and non-para athletes. This group was expanded to include clinicians, researchers, para athletes with experience of concussion and other experts with experience in this field. Initially, a face-to-face meeting was planned for May 2020, however, owing to the COVID-19 pandemic, this was adapted to a video conference split over two consecutive afternoons in June 2020.¹⁰

The process was conducted over nine phases: (1) initial discussions and selection of members of the consensus group; (2) assignment of designated topic areas to four working groups; (3) review of CISG consensus key sections by each working group, with consideration of issues, key questions and knowledge gaps concerning para athletes; (4) circulation of each working group's written summary of their review and discussions on each designated topic area, (5) a 2-day consensus meeting held on the 15–16 June 2020, during which all contributions were discussed by the whole consensus group section by section; (6) revision of drafts by working groups according to the input received and consensus reached during the meetings; (7) a final consensus meeting held on the 24th of September 2020 to verify and agree on all changes; (8) final edits made by an editorial group (RW, OHA and EV) and (9) review and approval of the final draft by all consensus group members.

The four working groups were tasked with exploring key clinical areas of CIPS described in the most recent consensus statement of CIS,⁹ and were divided into: concussion assessment; concussion management; return to sport (RTS) following concussion; and specific considerations related to the different impairments in Para athletes.

RECOMMENDATIONS FOR CONCUSSION ASSESSMENT FOR PARA ATHLETES

Clinical assessments

A key point within the SCAT5 highlights that 'the diagnosis of a concussion is a clinical judgement, made by a medical professional'. In light of our considerations of concussion assessment for the para athlete, this becomes even more important. As part of the overall assessment an attending medical professional may choose to seek a corroborative history from suitable family members or carers, if available, to assist them in clinical decision making. Concussion in the para athlete population should, to the extent possible, be managed according to existing concussion consensus guidelines. The SCAT5 should not be used in and of

itself to make, or exclude, the diagnosis of concussion in a para athlete, and a para athlete may have a concussion even if their SCAT5 is deemed to be 'normal'. If the clinician has concerns regarding the assessment or return to play (RTP) progression, they should err on the side of caution when making decisions.

In the para athlete population, the importance of clinicians performing routine baseline periodic preparticipation examinations (PPE) is emphasised in order to establish a point of reference for the assessment of concussion symptoms in the future (and also more generally for subsequent injury or illness). This should include consideration of para athletes' baseline cognitive function and their visual or physical abilities. Paradoxically, while SCAT5 baseline testing cannot be mandated for para athletes (due to the lack of validity in general populations and an even greater variability of baseline scores between different disability groups), the clinician attending to a para athlete with a suspected concussion has a much greater need to have a comprehensive understanding of a para athlete's preinjury cognitive function and abilities in order to make a diagnosis of concussion and manage the athlete more effectively. Additionally, it is recommended that a team clinician with prior knowledge of the athlete is involved in the acute assessment of the potentially concussed athlete. The feasibility of this may be limited in some sport contexts, depending on the sport specific rules, (eg, team clinicians may not be permitted access to the field of play) and some teams may not travel with the support of a team physician, physiotherapist or athletic therapist. These shortcomings need to be considered by International Federations, with consideration given to amending regulations for cases in which a head injury has been observed.

Recognise and remove

In concurrence with the existing SCAT5, any para athlete with a suspected concussion must be removed from practice or play and should not be allowed to return to activity until a medical assessment is conducted (even if their symptoms resolve).^{11 12} Emergency medical services must be called immediately if SCAT5 'red flag' signs and symptoms for a severe brain injury are suspected.

Existing concussion recognition and assessment tools (namely the CRT5¹¹ and SCAT5¹²) assume certain 'normal' athlete functions to complete these assessments. They can be used to assess suspected concussion in para athletes, but the clinical user must be aware of limitations. SCAT5 requires an athlete to be able to see, to read, to hear, and to understand with competence, while also having normal baseline speech, language, manual dexterity, and safe range of movement of the cervical spine. These baseline functions may be impaired for some para athletes and it is crucial to recognise this during the initial and following assessments for a suspected concussion. Some para athletes may have a combination of impairments relating to any number of these functions, and these may pose barriers and challenges when trying to undertake head injury assessments following an injury. The validity of any adaptations to concussion assessment tools for para athletes needs to be established.

Para athlete customised assessment tools

The appendices were collated for each sport specific impairment type using all questions from the 'immediate or on-field assessment' section of SCAT5 and the 'office or off-field assessment' sections of SCAT5 (online supplemental files). A traffic light system was used, whereby green shading represents no anticipated additional considerations for para athletes, yellow shading represents potential additional considerations for some

para athletes (dependent on the level or nature of athlete impairment), and red shading represents items from the SCAT5 that should not be used for para athletes. The appendices present specific considerations for the use of each SCAT5 item in the immediate on-field and office or off-field assessments of a suspected concussion in para athletes with:

- ▶ (Single) upper limb deficiency.
- ▶ (Bilateral) upper limb deficiency.
- ▶ (Single) lower limb deficiency.
- ▶ (Bilateral) lower limb deficiency.
- ▶ Impaired vision.
- ▶ Absent vision.
- ▶ Globe absent.
- ▶ Spinal cord injury (SCI) with quadriplegia.
- ▶ SCI with paraplegia.
- ▶ CP with spastic diplegia.
- ▶ CP with spastic hemiplegia.
- ▶ CP with spastic quadriplegia.
- ▶ Dyskinetic CP.
- ▶ Ataxic CP.
- ▶ Mixed CP.
- ▶ Intellectual impairment.
- ▶ Achondroplasia.
- ▶ Arthrogryposis.
- ▶ Polio.
- ▶ Muscular dystrophy.
- ▶ Multiple sclerosis.
- ▶ Spina bifida.

Examples of SCAT5 sport-specific impairment considerations

For immediate assessment, para athletes with total vision loss, regardless of whether the globe is intact, damaged or absent will not be able to report double vision or demonstrate a 'blank or vacant' facial expression after a head injury. Furthermore, the best eye response on the Glasgow Coma Scale (GCS) may be limited in non-concussed Para athletes with visual impairments and so a need for a baseline GCS score becomes important to be able to make comparison if they suffer a suspected concussion.

For athletes with Down's syndrome, or achondroplasia or osteogenesis imperfecta, caution is needed when examining the cervical spine because of the associated risk of atlantoaxial instability. Similar caution will be required for those with previous cervical injury as a cause of their existing SCI. Neurological screening tests and use of symptom lists may require alternative methods for communication (eg, Braille or text to speech technology for athletes with visual impairment), or the use of different wording to explain symptoms and visual prompts for athletes with intellectual impairment. For athletes with SCI and other more severe forms of lower limb neurological impairment, use of balance tests is not possible. Alternative tests such as the wheelchair error scoring system (WESS),¹³ if validated in this setting, may emerge as suitable clinical alternatives.

Intellectual impairment (which sometimes is also associated with CP, some neurological disorders, previous significant head injuries, vision impairment and spina bifida) poses significant challenges for the reliable assessment of cognitive function and may affect the results of many SCAT5 cognitive tests. Furthermore, the degree of intellectual impairment may also affect the reliability and repeatability of the assessments as a baseline or comparative tool during recovery. Athletes with arthrogryposis, post-polio syndrome, muscular dystrophy, multiple sclerosis and spina bifida commonly have challenges with lower limb strength and balance. Results of neurological screening tests are variable

depending on the level of impairment, and assessments of these athletes must therefore be interpreted with caution.

CONCUSSION MANAGEMENT FOR PARA ATHLETES

It is important to be aware of the need for special attention and/or modification of these recommendations depending on the unique nature of the para athlete's impairment. Table 1 outlines some of the considerations for the management of the Para athlete, based on the 2017 CIS Consensus Statement.

Recognise and remove: once concussion is suspected the athlete should be removed from play or practice

The most important steps in concussion management are the recognition that a concussion may have occurred, and the subsequent removal of the athlete from the game or practice for further assessment. While there may be challenges relating to the assessment in some cases with the Para athlete, once a concussion is suspected, it is critical that the para athlete is removed to prevent further harm. In some instances, para athletes with certain impairments might require special considerations (eg, para athletes with intellectual impairment may have more difficulty understanding the need for removal from play).

Rest: brief period of physical and cognitive rest (24–48 hours)

After concussion there should follow a brief period of 24–48 hours of physical and cognitive rest, during which it is noted that there may be challenges for para athletes who are wheelchair users given their additional energy expenditure needed to propel a wheelchair and engage in wheelchair transfers for daily activities. If these activities lead to an exacerbation of their concussion symptoms, strategies to reduce their exertion may be required, for example, assistance with transfers, and assisting with or reducing the need to self-propel. Athletes with high support needs who typically require some level of assistance for activities of daily living may require 24-hour surveillance to enable them to rest and prevent further injury.

Active rest: gradual and progressive increase in activity while staying below their cognitive and physical exacerbation thresholds (activity should not worsen symptoms)

In most cases, after a few days of rest, athletes should be able to gradually increase their daily activity level as long as their symptoms do not deteriorate. As the para athlete begins to gradually increase their level of physical activity, the mechanism for testing submaximal exercise threshold may require modification. For example, stationary cycling is often used as a submaximal exercise challenge, but this will not be possible for wheelchair users and possibly not for amputees or those with marked leg length discrepancies. Alternative activities such as the use of a hand cycle could be used as an alternative. Balance testing and testing of reaction time may also need to be adapted to accommodate different impairments with specific attention to any differences from baseline.

RTS, reconsider: graduated return to activities, using return to work or school and RTS strategies. Return to work or school should come before RTS

As in the general population, the priority for para athletes attending work or school should be returning to work or school first without a deterioration in symptoms, rather than returning to sport. If applicable in school or work, previously existing accommodations due to disability should remain in place post-concussion to prevent unfamiliar changes to the environment

Table 1 Para concussion considerations for return to play

| | Concussion suspected—remove athlete from play | Brief period of physical and cognitive rest | Gradual and progressive increase in activity while staying below their cognitive and physical exacerbation thresholds (activity should not worsen symptoms) | Graduated return to activities. Return to school should come before return to sport. | Return to school strategy: 1. activities at Home that do not produce symptoms, 2. School activities at home, 3. Return to school part time, 4. Return to school full time | Return to sport strategy: 1. symptom limited activity, 2. Light aerobic exercise, 3. Sport specific exercise, 4. Non-contact drills, 5. Return to sport | Management of persistent symptoms (symptoms which persist beyond 10–14 days in adults, or beyond 4 weeks in children) |
|--|---|--|--|--|---|---|--|
| Impaired muscle power—spinal cord injury | No variation from standard management | For w/c users, physical rest may need to include considerations regarding manual w/c use and transfers | Mechanism for testing submaximal exercise challenge may need modification; balance testing and testing of reaction time may need to be augmented to accommodate baseline weakness and balance deficits | No variation from standard management | No variation from standard management | Mechanism for return to sport should be sport-specific and adapted to the individuals Para sport (ie, generic approach not appropriate) | Mechanism for implementing certain aspects of vestibular therapy requires augmentation for w/c users; Mechanism for implementing c-spine rehabilitation may require augmentation for those with h/o cervical SCI |
| Impaired muscle power - lower motor neuron | No variation from standard management | For w/c users, physical rest may need to include considerations regarding manual w/c use and transfers | Mechanism for testing submaximal exercise challenge may need modification; balance testing and testing of reaction time may need to be augmented to accommodate baseline weakness and balance deficits | No variation from standard management | No variation from standard management | Mechanism for return to sport should be sport-specific and adapted to the individuals Para sport (ie, generic approach not appropriate) | Mechanism for implementing certain aspects of vestibular therapy requires augmentation for w/c users; Mechanism for implementing certain aspects of vestibular therapy requires augmentation for those with h/o cervical SCI |
| Impaired passive range of movement | No variation from standard management | No variation from standard management | Cycling which is often used as a submaximal exercise challenge might not be possible in some amputees. Balance testing or gait inspection might not be a reliable test to gauge return to training | No variation from standard management | No variation from standard management | Cycling which is often used as a submaximal exercise challenge might not be possible in some amputees. Balance testing or gait inspection might not be a reliable test to gauge return to sport (unless the healthcare provider has a good understanding of baseline function) | Certain elements of balance training might require adaptation |
| Amputee/limb deficiency | No variation from standard management | No variation from standard management | Cycling which is often used as a submaximal exercise challenge might not be possible in some amputees. Balance testing or gait inspection might not be a reliable test to gauge return to training | No variation from standard management | No variation from standard management | Cycling which is often used as a submaximal exercise challenge might not be possible in some athletes with leg length difference. Balance testing or gait might not be a reliable test to gauge return to sport (unless the healthcare provider has a good sense of the gait pattern before injury) | Certain elements of balance training might require adaptation |
| Leg length difference | No variation from standard management | No variation from standard management | Cycling which is often used as a submaximal exercise challenge might not be possible in some athletes with leg length difference. Balance testing or gait might not be a reliable test to gauge return to training | No variation from standard management | No variation from standard management | Cycling which is often used as a submaximal exercise challenge might not be possible in some athletes with leg length difference. Balance testing or gait might not be a reliable test to gauge return to sport (unless the healthcare provider has a good sense of the gait pattern before injury) | Certain elements of balance training might require adaptation |

Continued

Consensus statement

(eg, in school a smaller classroom size for students with concentration difficulties due to intellectual impairment).

As described in the 2017 CIS consensus statement, any RTS strategy should follow a stepwise graduated RTS approach after the initial period of rest and providing they remain free of any symptoms. This should begin with symptom-limited activity, then progression through: light aerobic exercise; sport-specific training; non-contact training drills/resumption of resistance training; contact activity (if applicable); then a RTS. Clinical experience supports that the same strategy be adopted for para athletes, but the mechanism for graduated RTS should be sport specific. For some para athletes, the use of balance and gait testing will not be reliable to help guide their RTS. In the visually impaired athlete competing with a guide, graduated training with the guide is important to simulate the athlete's sport-specific training and competition environment during their gradual return to normal activity. The guide may also be able to observe for signs suggesting recovery has not yet been achieved, for example, abnormal balance.

Refer: management of persistent symptoms (symptoms which persist beyond 10–14 days in adults, or beyond 4 weeks in children)

Some para athletes will have persistent symptoms following a concussion. The 2017 CIS Consensus Statement states that treatment should be individualised to best address specific medical, physical, and psychosocial factors. It reported evidence to support symptom limited aerobic exercise, physiotherapy for cervical spine or vestibular dysfunction, and cognitive-behavioural therapy (CBT) for persistent mood or behavioural issues.¹⁴ Slight modifications may be needed for the para athlete. For example, the mechanism for implementing certain aspects of vestibular therapy requires augmentation for wheelchair users, athletes with prior central neurologic injury and visually impaired athletes.¹⁵ The mechanism for implementing cervical spine rehabilitation may require adaptation for those with cervical SCI, and in visually impaired athletes who may report baseline chronic neck pain.¹⁶ While CBT may be used in para athletes with intellectual impairment, the process by which this occurs may need to be adapted.^{17 18}

RTS FOLLOWING CONCUSSION IN THE PARA ATHLETE

The 2017 CIS Consensus Statement⁹ and accompanying SCAT5¹² outline the current best practice for RTS following concussion, but do not take into account the nuances associated with the para athlete. Furthermore, clinicians and coaches working in para sport have been shown to have gaps in their knowledge relating to RTS following concussion.¹⁹

In the absence of a current RTS strategy which is specific to the para athlete, the use of the existing RTS strategy from the 2017 CIS Consensus Statement is recommended for para athletes. The RTS strategy recommends an initial 24–48 hours period of physical and cognitive rest before beginning the RTS progression once symptom free. Clinicians are advised to consider whether para athletes may need a longer initial period of physical/cognitive rest prior to starting RTS over and above the 48 hours guideline prior to starting RTS in graduated RTS strategy for impairment specific reasons, for example, if they have a history of previous central nervous system (CNS) injury or impaired CNS function at baseline.

Implications for RTS following concussion in specific para athlete cohorts

For many para athlete cohorts there may be specific considerations for RTS programmes. While an increasing progression of

exertion during RTS is indicated, it should be recognised that para athletes with SCI (T6 and above) may have alterations in their cardiovascular and autonomic responses restricting maximal heart rate (HR), for example.²⁰ This would make the use of percentages of maximum HR unreliable, and the use of perceived exertions to monitor the cardiovascular response is advised. As such, a lower level of exertion may be advised for para athletes during this RTS process.

For para athletes with visual impairment, many signs and symptoms that clinicians monitor during the RTS process (eg, dizziness, headache, blurred vision, poor balance) may be pre-existing.²¹ Care is needed when distinguishing symptoms elicited during the RTS process from baseline values in this cohort, and it is incumbent on the evaluating clinician to specifically ask about 'change from normal' as opposed to the presence of a symptom. Para athletes with intellectual impairment may have difficulty in understanding the progression and pacing of the different stages in RTS following concussion and are likely to need closer supervision at all stages of the RTS process. Many para athletes (eg, those with CP, stroke, traumatic brain injury) already present with some degree of neurological impairment and a longer/more cautious RTS strategy may be required.

Across all of the para athlete groups, there may be psychological responses to RTS which vary from those of non-para athletes.²² Reactions and behaviours related to the process of RTS itself (eg, increased risk taking) may be amplified for para athletes. Since fewer athletes compete in para sport, particularly team sports, extra pressure (intrinsic or extrinsic) may also influence RTS decision making. These reactions and behaviours may be magnified due to the support structures in place around the para athlete, as some coaches working in para sport have been shown to lack knowledge about training and athlete health.²³

Recommendations for RTS following concussion in the para athlete

Case-by-case decision making related to RTS postconcussion is crucial for non-para athletes. Given the unique presentations of many para athletes, this individualisation of care is even more paramount. Preparticipation data collected via the SCAT5 (eg, balance and symptoms of headache) and other clinical or athlete-specific information may help to provide clinical context when evaluating RTP testing. For athletes who are wheelchair users, walking and running drills in the existing graduated RTS strategy will need to be adjusted to wheelchair-based drills instead. For athletes using wheelchairs who participate in a contact sport (eg, wheelchair rugby, para ice hockey, wheelchair basketball) then full contact practice as part of RTS should be centred around individualised drills, away from other players due to the increased risk of collisions.¹³ Due to the increased risk of concussion in VI sport,^{2 24 25} VI athletes involved in contact sport (eg, blind football, blind judo or goalball) should also conduct their full contact practice as part of RTS away from other players.

Ideally, a para athlete should have the same support during the graduated RTS phases as non-para athletes (eg, a doctor, physiotherapist or athletic therapist knowledgeable in the specific sport that can guide the Para athlete through the different RTS stages). The final decision on when the para athlete returns to sport should always be taken by a doctor with the skills, knowledge and training to make this decision. This is especially pertinent in the instances of para athletes from high-risk populations (eg, those with a pre-existing brain injury such as CP, stroke or traumatic brain injury) who have sustained multiple concussions, and where guidance and discussion is needed regarding possible retirement.

ADDITIONAL CONSIDERATIONS OF CONCUSSION IN PARA ATHLETES

It is commonly agreed that para athletes can experience the same spectrum of medical conditions as non-para athletes, but there are several considerations that can make the functional consequences of an injury considerably different. A first consideration is the specific context in which the para athlete participates and performs, which differs considerably from the non-para athlete. Often, the supporting structures around para athletes may be less organised and controlled, with reduced access to formalised and organised training. As a result, para athletes often train alone.¹⁹ There may also be a more limited range of formal competitive sporting events for para athletes, limiting the para athlete's ability to get acquainted with the particular stresses and pressure of competition.²⁶ A smaller competition programme may offer reduced opportunities for selection and qualification and may add pressure toward early RTS. While it is expected that para athletes practice routine preventive measures to maintain optimal health, it is known that they often do not seek medical consultation for problems considered inherent to their impairment. Consequently, para athletes often try to 'work through' an injury or discomfort and report to medical staff with delay.^{23 27} Additional challenges arise when team staff and medical staff in para sport are appointed on an event base, and during these events there is not always specialised care and support available. This has a natural impact on instances of concussive injury, as the specific context of para athletes and their ability to train and compete demands specific approaches in terms of education and implementation of concussion guidelines.

Prevention

To develop a successful injury prevention programme, detailed information on the magnitude, burden, risk factors and mechanisms of the health issue are needed. The best available evidence stems from large competitions where valid data are obtained through available event registries.^{1-3 27 28} However, the diagnostic accuracy of concussion incidents in these reports remains unknown. Outside of the data from larger competitions, we know little about the actual risk of CIPS, and where prevention efforts should be focused. A risk-rating table has been developed to estimate concussion risk based on sport, impairment, impact speed, collision potential and head protection which provides a starting point.²⁹ However, there is further evidence that suggests underreporting or misreporting of CIPS is a significant problem, including a study in wheelchair basketball where 44% of respondents did not report their concussion.^{2 28 29}

The concept of the '3 E's of Injury Prevention': education, enforcement and engineering (or environment) are equally applicable to CIPS.

Education

Education of clinicians, sports technical staff and athletes is crucial. There is an obvious gap in knowledge related to CIPS. This gap must be filled to develop tailored approaches for concussion assessment and management in this population. This applies to generic information about concussion, but more so to para sport specific issues. For example, while concussion in the Para athlete may impact sports participation, there is also an impact on the para athlete's ability to participate in daily life and potentially other disability-related consequences. Given the lesser availability of specially trained personnel and medical staff for para athletes during training and competition, there may also be an onus on the Para athlete to recognise and report concussive

symptoms. The implementation of concussion guidelines in para sport should, therefore, include the notion that the application of these guidelines should be possible for non-medically trained users (eg, coaches). In turn, placing further demands on concussion education and training of the appropriate end-users in para sport that is pitched at an appropriate level.

The dissemination of guidelines for RTS following CIPS should be tailored towards an athlete-friendly format that is accessible to the needs of the specific athlete (eg, using a speech synthesiser, braille, assistive writing technology or large font). In para sport some coaches may be former para athletes themselves, and if they are overseeing part of the graduated RTS process then it is important to consider accessibility for any RTS information also provided to them. Para athletes with intellectual impairment will require guidelines that are easy-to-read and will need sufficient support with comprehending and following these guidelines.

Enforcement

Enforcement relates to the rules or laws of the sport and changes can be made to enhance safety. As an example, a critical analysis of the high number and nature of injuries during the Para Alpine Skiing during the 2014 Paralympic Winter Games in Sochi³⁰ led to a closer collaboration and interaction between medical and sport-technical experts, resulting in an action plan that was successfully implemented in the subsequent 2018 Paralympic Winter Games in PyeongChang. These measures included: adjustments to the slope settings; more training runs; and real-time interaction between the medical team and the sport officials during races.³¹ Such examples may serve as illustrations for other sports to realise supportive changes in policy and, more importantly, in rules. Most recently, World Para Alpine Skiing, World Para Snowboard and World Para Nordic Skiing have inserted concussion specific rules in the sport-technical rules. These allow for non-medically trained individuals (eg, a technical delegate) to initiate a primary concussion assessment in accordance with the FIS Alpine Skiing protocols. Similarly, CP Football has led by example through introducing a concussion substitution rule.^{32 33} In case of a suspected concussion, there is a 10 min window in which a substitute player may enter the field while the injured player is being assessed for concussion. If the player can continue play, he or she can return to the field without the loss of a substituted player. If he or she needs to forfeit the game, the substituted player is already on the pitch. This allows the medical staff to carefully assess and decide on the suspected concussion without the pressure of an athlete number disadvantage or time.

Engineering (for environment)

The role of protective equipment in concussion prevention is a subject of much debate and research in some professional sports. Its role has yet to be fully evaluated in para sports, however there is early work by the International Blind Sports Association (IBSA) for the sport of Football 5-a-side. In Football 5-a-side (also commonly known as blind football) athletes are blindfolded on the field of play to ensure athletes with some vision are not advantaged and players orient themselves to the sound of a ball that has integrated bells. Head-to-head contact cannot always be avoided and given anecdotal evidence of concussion, IBSA initiated an internal study on the feasibility of softshell helmets with integrated goggles. There is not enough known to recommend protective equipment currently in prevention of concussion.

Consensus statement

Crucial to all considerations is a continued dialogue between medical experts, sport technical experts and athletes, so that all parties have their input to the proposed measures and targeted outcomes, assessment of feasibility and ultimately acceptance of any proposed policy or ruling.

SUMMARY

Clinicians working with para athletes must fully understand and appreciate the limitations when applying existing concussion consensus guidance to the para athlete population. 'Normal' baseline functions cannot be assumed in para sport and while validity of any adaptations to assessment tools needs to be established, it is essential that clinicians working with para athletes are familiar with an athletes' baseline or uninjured cognitive and neuromuscular function. This familiarity can only be established through regular periodic PPEs and consideration of the use of SCAT5 and other neurocognitive assessment tools.

In the meantime, concussion in the para athlete population should, to the extent possible, be managed according to existing concussion consensus guidelines. If the clinician has concerns regarding the assessment or return to play progression, they should err on the side of caution when making decisions. The quotation from the 2017 CIS Consensus Statement that 'diagnosis of a concussion remains a clinical judgement, made by a medical professional' is potentially even more relevant for Para athletes. The SCAT5 should not be used by itself to make or exclude the diagnosis of concussion in a para athlete, and a para athlete may have a concussion even if their SCAT5 is deemed to be 'normal'. All aspects of our first position statement as the CIPS group should be considered with the immediate and postconcussion assessments, management, RTS and additional considerations when providing care for a para athlete with a suspected concussion.

What is already known?

- ▶ Injury surveillance data from the most recent summer and winter Paralympic Games, demonstrates high rates of injuries to the head and face.
- ▶ Despite a paucity of research, the concussion issues faced by para athletes and their support staff are of concern and therefore specific recommendations for standards of care are needed.
- ▶ Clinical tools assessing brain function are widely acknowledged to be helpful following concussion, but these tools are neither validated nor applicable in many respects within a para sport population.

What are new findings?

- ▶ Medical professionals should continue to use Sport Concussion Assessment Tool 5 (SCAT5) for 'on' and 'off' field concussion assessment for para athletes and the Concussion in Para Sport appendices can serve as a guide to interpret these results.
- ▶ Para athletes may have a concussion even if their SCAT5 is deemed to be 'normal'. Consequently, SCAT5 should not be used by itself to diagnose concussion in para athletes.
- ▶ Given the challenges of diagnosing concussion in para athletes, periodic baseline pre participation evaluations are essential as a point of reference.

Research relating to all aspects of concussion in para athletes is urgently needed to develop a better understanding of the intricacies of this injury in this population. This research will facilitate the process of generating a consensus statement on CIPS, which in turn will improve the safety and welfare of all athletes and staff. In the meantime, regular periodic examinations for para athletes are needed as a reference point post-concussion, in association with improved concussion education and awareness for para clinicians, coaches and athletes. The CIPS will work collaboratively with major sporting organisations to help achieve these aims.

Author affiliations

- ¹Amsterdam Collaboration on Health and Safety in Sports, Department of Public and Occupational Health, EMGO Institute for Health and Care Research, VU University Medical Centre Amsterdam, Amsterdam, Noord-Holland, The Netherlands
- ²Sport & Exercise Medicine, Fortius Clinic, London, UK
- ³Para Football Foundation, Arnhem, The Netherlands
- ⁴Department of Physical Medicine and Rehabilitation, Spaulding Rehabilitation; Spaulding Hospital/Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts, USA
- ⁵Kelley Adaptive Sports Research Institute, Boston, Massachusetts, USA
- ⁶University of Hertfordshire, Hatfield, UK
- ⁷School of Optometry & Vision Science, University of Waterloo, Waterloo, Ontario, Canada
- ⁸Institute of Sport and Exercise Medicine, Division of Orthopaedic Surgery, Department of Surgical Sciences, Stellenbosch University Faculty of Medicine and Health Sciences, Cape Town, South Africa
- ⁹IOC Research Center, South Africa, South Africa
- ¹⁰Rehabilitation Medicine Research Group, Department of Health Sciences, Lund University, Lund, Sweden
- ¹¹Department of Orthopaedic Surgery, Amsterdam UMC, University of Amsterdam, Amsterdam Movement Sciences, Amsterdam, The Netherlands
- ¹²Department of Family Medicine, University of Ottawa, Ottawa, Ontario, Canada
- ¹³International Paralympic Committee Medical Committee, Ottawa, Ontario, Canada
- ¹⁴Spinal Cord Injury/Disorder, Physical Medicine & Rehabilitation, Medical College of Wisconsin, Milwaukee, Wisconsin, USA
- ¹⁵International Paralympic Committee, Bonn, Germany
- ¹⁶Centre for Sport and Exercise Science and Medicine, University of Brighton, Eastbourne, UK
- ¹⁷University Hospitals Dorset NHS Foundation Trust, Poole, UK
- ¹⁸School of Sport, Health and Exercise Science, University of Portsmouth, Portsmouth, UK

Twitter Cheri Blauwet @CheriBlauwetMD, David Clarke @ClarkieGB7, Wayne Derman @WDerman, Kristina Fagher @KristinaFagher, Vincent Gouttebarga @Vgouttebarga, James Kissick @Jay_Doc4, Jan Lexell @JanLexell, Evert Verhagen @Evertverhagen, Nick Webborn @SportwiseUK and Osman Hassan Ahmed @osmanhahmed

Contributors An initial multidisciplinary panel of experts group was selected, who are academically and/or clinically experienced in para sport or concussion. This group was expanded to include clinicians, researchers and other experts with experience in this field. Initially, a face-to-face meeting was planned for May 2020, however, owing to the COVID-19 pandemic, this was adapted to a video conference split over 2 consecutive afternoons in June 2020. The process was conducted over 9 phases: (1) initial discussions and selection of members of the consensus group; (2) assignment of designated topic areas to four working groups; (3) review of CISP consensus key sections by each working group, with consideration of issues, key questions and knowledge gaps concerning para athletes; (4) circulation of each working group's written summary of their review and discussions on each designated topic area; (5) a 2-day consensus meeting held on the 15–16 June 2020, during which all contributions were discussed by the whole consensus group section by section; (6) revision of drafts by working groups according to the input received and consensus reached during the meetings; (7) a final consensus meeting held on the 24 September 2020 to verify and agree all changes; (8) final edits made by an editorial group (RW, OHA and EV); (9) review and approval of the final draft by all consensus group members. The four working groups were tasked with exploring key clinical areas of concussion in para sport described in the most recent consensus statement of concussion in sport, and were divided into: concussion assessment; concussion management; return-to-sport following concussion; and specific considerations related to the different impairments in Para athletes.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iDs

Richard Weiler <http://orcid.org/0000-0002-6216-839X>
 Cheri Blauwet <http://orcid.org/0000-0001-8568-1009>
 Kristine Dalton <http://orcid.org/0000-0002-2616-4797>
 Wayne Derman <http://orcid.org/0000-0002-8879-177X>
 Kristina Fagher <http://orcid.org/0000-0002-9524-7553>
 Vincent Gouttebarghe <http://orcid.org/0000-0002-0126-4177>
 James Kissick <http://orcid.org/0000-0002-7748-9225>
 Kenneth Lee <http://orcid.org/0000-0002-9378-673X>
 Jan Lexell <http://orcid.org/0000-0001-5294-3332>
 Peter Van de Vliet <http://orcid.org/0000-0002-1434-3659>
 Evert Verhagen <http://orcid.org/0000-0001-9227-8234>
 Nick Webborn <http://orcid.org/0000-0003-3636-5557>
 Osman Hassan Ahmed <http://orcid.org/0000-0002-1439-0076>

REFERENCES

- Derman W, Runciman P, Jordaan E, et al. High incidence of injuries at the Pyeongchang 2018 Paralympic winter games: a prospective cohort study of 6804 athlete days. *Br J Sports Med* 2020;54:38–43.
- Webborn N, Cushman D, Blauwet CA, et al. The Epidemiology of Injuries in Football at the London 2012 Paralympic Games. *PM&R* 2016;8:545–52.
- Derman W, Runciman P, Schweltnus M, et al. High precompetition injury rate dominates the injury profile at the Rio 2016 Summer Paralympic Games: a prospective cohort study of 51 198 athlete days. *Br J Sports Med* 2018;52:24–31.
- Griffin S, West LR, Ahmed OH, et al. Concussion knowledge, attitudes, and beliefs amongst sports medicine personnel at the 2015 Cerebral Palsy Football World CHAMPIONSHIPS. *Br J Sports Med* 2017;51:325.
- Derman W, Badenhorst M, Blauwet CA. Para sport translation of IOC consensus on the recording and reporting of data for injury and illness in sport. *Br J Sports Med* 2020.
- World Health Organization. Towards a common language for Functioning, Disability and Health - ICF, 2002. Available: <https://www.who.int/classifications/icf/icfbeginnersguide.pdf> [Accessed 8 Jan 2021].
- World Health Organization. The International classification of functioning, disability and health, 2001. Geneva. Available: <https://apps.who.int/iris/bitstream/handle/10665/42407/9241545429.pdf> [Accessed 28-03-2021].
- Weiler R, van Mechelen W, Fuller C, et al. Do neurocognitive SCAT3 baseline test scores differ between footballers (soccer) living with and without disability? A cross-sectional study. *Clin J Sport Med* 2018;28:43–50.
- McCrorry P, Meeuwisse W, Dvořák J, et al. Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016. *Br J Sports Med* 2017;51:838–47.
- Ahmed OH, Verhagen E, Derman W. International sports and exercise medicine consensus meetings in the COVID-19 era: Zoom-ing across borders. *BJSM Blog*, 2020. Available: <https://blogs.bmj.com/bjism/2020/07/31/international-sports-and-exercise-medicine-consensus-meetings-in-the-covid-19-era-zoom-ing-across-borders/> [Accessed 28-03-2021].
- Echemendia RJ, Meeuwisse W, McCrorry P, et al. The concussion recognition tool 5th edition (CRT5): background and rationale. *Br J Sports Med* 2017;51:870–1.
- Sport concussion assessment tool - 5th edition. *Br J Sports Med* 2017;51:851–8.
- Wessels K. Concussion assessment in wheelchair users: quantifying seated postural control. University of Illinois at Urbana-Champaign, 2013. Available: https://www.ideals.illinois.edu/bitstream/handle/2142/46829/Karla_Wessels.pdf?sequence=1&isAllowed=y [Accessed 8 Jan 2021].
- Manley G, Gardner AJ, Schneider KJ, et al. A systematic review of potential long-term effects of sport-related concussion. *Br J Sports Med* 2017;51:969–77.
- da Silva ES, Fischer G, da Rosa RG, et al. Gait and functionality of individuals with visual impairment who participate in sports. *Gait Posture* 2018;62:355–8.
- Sánchez-González MC, Gutiérrez-Sánchez E, Sánchez-González J-M, et al. Visual system disorders and musculoskeletal neck complaints: a systematic review and meta-analysis. *Ann N Y Acad Sci* 2019;1457:26–40.
- Roberts L, Kwan S. Putting the C into CBT: cognitive challenging with adults with mild to moderate intellectual disabilities and anxiety disorders. *Clin Psychol Psychother* 2018;25:662–71.
- Hronis A, Roberts L, Kneebone II. A review of cognitive impairments in children with intellectual disabilities: implications for cognitive behaviour therapy. *Br J Clin Psychol* 2017;56:189–207.
- West LR, Griffin S, Weiler R, et al. Management of concussion in disability sport: a different ball game? *Br J Sports Med* 2017;51:1050–1.
- West CR, Wong SC, Krassioukov AV. Autonomic cardiovascular control in Paralympic athletes with spinal cord injury. *Med Sci Sports Exerc* 2014;46:60–8.
- Fagher K. 118 S. sports-related injuries and illnesses in Paralympic athletes. Lund: Lund University: Faculty of Medicine. Doctoral Thesis, 2019. [https://portal.research.lu.se/portal/en/publications/sportsrelated-injuries-and-illnesses-in-paralympic-athletes\(ac2429cd-eee1-4747-8e93-b1475b1d69b1\).html](https://portal.research.lu.se/portal/en/publications/sportsrelated-injuries-and-illnesses-in-paralympic-athletes(ac2429cd-eee1-4747-8e93-b1475b1d69b1).html)
- Ahmed OH, Slater M, Barker JB. Concussion in athletes with disabilities. In: Bloom GA, Caron JG, eds. *Psychological aspects of sport-related concussions*, 2019.
- Fagher K, Forsberg A, Jacobsson J, et al. Paralympic athletes' perceptions of their experiences of sports-related injuries, risk factors and preventive possibilities. *Eur J Sport Sci* 2016;16:1240–9.
- Fagher K, Dahlström Örlan, Jacobsson J. Prevalence of Sports-Related injuries and illnesses in Paralympic athletes. *PM&R* 2020;12:271–80.
- Fagher K, Hassan Ahmed O, Pernheim N, et al. Prevalence of sports-related injuries in Paralympic judo: an exploratory study. *J Sci Med Sport* 2019;22:902–6.
- Van de Vliet P. Let's talk facts – What healthcare providers really need to know about Paralympic athletes. *Aspetar Sports Med J* 2016;5:74–9.
- Derman W, Schweltnus M, Jordaan E. Clinical characteristics of 385 illnesses of athletes with impairment reported on the WEB-ISS system during the London 2012 Paralympic Games. *PM&R* 2014;6:S23–30.
- Wessels KK, Broglio SP, Sosnoff JJ. Concussions in wheelchair basketball. *Arch Phys Med Rehabil* 2012;93:275–8.
- Kissick J, Webborn N. Concussion in para sport. *Phys Med Rehabil Clin N Am* 2018;29:299–311.
- Derman W, Blauwet C, Webborn N, et al. Mitigating risk of injury in alpine skiing in the Pyeongchang 2018 Paralympic winter games: the time is now! *Br J Sports Med* 2018;52:419–20.
- Blauwet C, Webborn N, Kissick J, et al. When van Mechelen's sequence of injury prevention model requires pragmatic and accelerated action: the case of para alpine skiing in Pyeong Chang 2018. *Br J Sports Med* 2019;53:1390–1.
- IFCPF. IFCPF unveils new temporary concussion substitution policy, 2020. Available: <https://www.ifcpf.com/news/ifcpf-unveils-new-temporary-concussion-substitution-%28tcs%29-policy> [Accessed 8 Jan 2021].
- Ahmed OH, Fulcher M, Malone D. The introduction of temporary concussion substitutions in disability football: Are we 'headed' in the right direction? *Football Med Perform* 2020;32:13–17.

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in athletes with (single) upper limb deficiency

| | | |
|---|--|--|
| STEP 1 RED FLAGS | Neck pain or tenderness | |
| | Double Vision | |
| | Weakness or tingling/burning in arms or legs | |
| | Severe or increasing headache | |
| | Seizure or convulsion | |
| | Loss of consciousness | |
| | Deteriorating conscious state | |
| | Vomiting | |
| | Increasingly restless, agitated or combative | |
| | | |
| STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface | |
| | Balance / gait difficulties / motor coordination | |
| | Disorientation or confusion | |
| | Blank or vacant look | |
| | Facial injury after head trauma | |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | |
| | Requires understanding | |
| | Requires speech | |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | |
| Best Eye Response | No eye opening | |
| | Eye opening in response to pain | |
| | Eye opening to speech | |
| | Eye opening spontaneously | |
| Best Verbal Response | No verbal response | |
| | Incomprehensible sounds | |
| | Inappropriate words | |
| | Confused | |
| | Oriented | |
| Best Motor Response | No motor response | |
| | Extension to pain | |
| | Abnormal flexion to pain | |
| | Flexion / Withdrawal to pain | |
| | Localizes to pain | |
| | Obeys commands | |
| CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | |
| | Full range of ACTIVE pain free movement? | |
| | Is the limb strength and sensation normal? | In residual limb consider associated deficit at baseline |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in athletes with (bilateral) upper limb deficiency

| | | |
|---|--|--|
| STEP 1 RED FLAGS | Neck pain or tenderness | |
| | Double Vision | |
| | Weakness or tingling/burning in arms or legs | |
| | Severe or increasing headache | |
| | Seizure or convulsion | |
| | Loss of consciousness | |
| | Deteriorating conscious state | |
| | Vomiting | |
| | Increasingly restless, agitated or combative | |
| | | |
| STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface | |
| | Balance / gait difficulties / motor coordination | |
| | Disorientation or confusion | |
| | Blank or vacant look | |
| | Facial injury after head trauma | |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | |
| | Requires understanding | |
| | Requires speech | |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | |
| Best Eye Response | No eye opening | |
| | Eye opening in response to pain | |
| | Eye opening to speech | |
| | Eye opening spontaneously | |
| Best Verbal Response | No verbal response | |
| | Incomprehensible sounds | |
| | Inappropriate words | |
| | Confused | |
| | Oriented | |
| Best Motor Response | No motor response | |
| | Extension to pain | |
| | Abnormal flexion to pain | |
| | Flexion / Withdrawal to pain | |
| | Localizes to pain | |
| | Obeys commands | |
| CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | |
| | Full range of ACTIVE pain free movement? | |
| | Is the limb strength and sensation normal? | In residual limb consider associated deficit at baseline |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in athletes with (single) lower limb deficiency

| | | | |
|---|--|--|--|
| STEP 1 RED FLAGS | Neck pain or tenderness | | |
| | Double Vision | | |
| | Weakness or tingling/burning in arms or legs | | |
| | Severe or increasing headache | | |
| | Seizure or convulsion | | |
| | Loss of consciousness | | |
| | Deteriorating conscious state | | |
| | Vomiting | | |
| | Increasingly restless, agitated or combative | | |
| | STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface | |
| | | Balance / gait difficulties / motor coordination | |
| Disorientation or confusion | | | |
| Blank or vacant look | | | |
| Facial injury after head trauma | | | |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | | |
| | Requires understanding | | |
| | Requires speech | | |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | | |
| Best Eye Response | No eye opening | | |
| | Eye opening in response to pain | | |
| | Eye opening to speech | | |
| | Eye opening spontaneously | | |
| Best Verbal Response | No verbal response | | |
| | Incomprehensible sounds | | |
| | Inappropriate words | | |
| | Confused | | |
| | Oriented | | |
| Best Motor Response | No motor response | | |
| | Extension to pain | | |
| | Abnormal flexion to pain | | |
| | Flexion / Withdrawal to pain | | |
| | Localizes to pain | | |
| | Obeys commands | | |
| CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | | |
| | Full range of ACTIVE pain free movement? | | |
| | Is the limb strength and sensation normal? | In residual limb consider associated deficit at baseline | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in athletes with (bilateral) lower limb deficiency

| | | |
|---|--|--|
| STEP 1 RED FLAGS | Neck pain or tenderness | Green |
| | Double Vision | Green |
| | Weakness or tingling/burning in arms or legs | Green |
| | Severe or increasing headache | Green |
| | Seizure or convulsion | Green |
| | Loss of consciousness | Green |
| | Deteriorating conscious state | Green |
| | Vomiting | Green |
| | Increasingly restless, agitated or combative | Green |
| | STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface |
| | Balance / gait difficulties / motor coordination | Yellow |
| | Disorientation or confusion | Green |
| | Blank or vacant look | Green |
| | Facial injury after head trauma | Green |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | Green |
| | Requires understanding | Green |
| | Requires speech | Green |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | |
| Best Eye Response | No eye opening | Green |
| | Eye opening in response to pain | Green |
| | Eye opening to speech | Green |
| | Eye opening spontaneously | Green |
| Best Verbal Response | No verbal response | Green |
| | Incomprehensible sounds | Green |
| | Inappropriate words | Green |
| | Confused | Green |
| | Oriented | Green |
| Best Motor Response | No motor response | Green |
| | Extension to pain | Green |
| | Abnormal flexion to pain | Green |
| | Flexion / Withdrawal to pain | Green |
| | Localizes to pain | Green |
| | Obeys commands | Green |
| CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | Green |
| | Full range of ACTIVE pain free movement? | Green |
| | Is the limb strength and sensation normal? | In residual limb consider associated deficit at baseline |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in athletes with impaired vision

| | | | |
|---|--|---|--|
| STEP 1 RED FLAGS | Neck pain or tenderness | | |
| | Double Vision | | |
| | Weakness or tingling/burning in arms or legs | | |
| | Severe or increasing headache | | |
| | Seizure or convulsion | | |
| | Loss of consciousness | | |
| | Deteriorating conscious state | | |
| | Vomiting | | |
| | Increasingly restless, agitated or combative | | |
| | STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface | |
| | | Balance / gait difficulties / motor coordination | |
| Disorientation or confusion | | | |
| Blank or vacant look | | | |
| Facial injury after head trauma | | Note pre-injury status | |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | Hearing can be affected in a small proportion of conditions | |
| | Requires understanding | | |
| | Requires speech | | |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | | |
| Best Eye Response | No eye opening | | |
| | Eye opening in response to pain | | |
| | Eye opening to speech | | |
| | Eye opening spontaneously | | |
| Best Verbal Response | No verbal response | | |
| | Incomprehensible sounds | | |
| | Inappropriate words | | |
| | Confused | | |
| | Oriented | | |
| Best Motor Response | No motor response | | |
| | Extension to pain | | |
| | Abnormal flexion to pain | | |
| | Flexion / Withdrawal to pain | | |
| | Localizes to pain | | |
| | Obeys commands | | |
| CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | | |
| | Full range of ACTIVE pain free movement? | | |
| | Is the limb strength and sensation normal? | | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in athletes with absent vision

| | | |
|---|--|--|
| STEP 1 RED FLAGS | Neck pain or tenderness | Green |
| | Double Vision | Red |
| | Weakness or tingling/burning in arms or legs | Green |
| | Severe or increasing headache | Green |
| | Seizure or convulsion | Green |
| | Loss of consciousness | Green |
| | Deteriorating conscious state | Green |
| | Vomiting | Green |
| | Increasingly restless, agitated or combative | Green |
| | Increasingly drowsy or difficult to arouse | Green |
| STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface | Green |
| | Balance / gait difficulties / motor coordination | Yellow |
| | Disorientation or confusion | Green |
| | Blank or vacant look | Red |
| | Facial injury after head trauma | Yellow Note pre-injury status |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | Green Hearing can be affected in a small proportion of conditions |
| | Requires understanding | Green |
| | Requires speech | Green |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | |
| Best Eye Response | No eye opening | Green |
| | Eye opening in response to pain | Green |
| | Eye opening to speech | Green |
| | Eye opening spontaneously | Green |
| Best Verbal Response | No verbal response | Green |
| | Incomprehensible sounds | Green |
| | Inappropriate words | Green |
| | Confused | Green |
| | Oriented | Green |
| Best Motor Response | No motor response | Green |
| | Extension to pain | Green |
| | Abnormal flexion to pain | Green |
| | Flexion / Withdrawal to pain | Green |
| | Localizes to pain | Green |
| | Obeys commands | Green |
| CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | Green |
| | Full range of ACTIVE pain free movement? | Green |
| | Is the limb strength and sensation normal? | Green |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in athletes with globe absent

| | | |
|---|--|---|
| STEP 1 RED FLAGS | Neck pain or tenderness | Green |
| | Double Vision | Red |
| | Weakness or tingling/burning in arms or legs | Green |
| | Severe or increasing headache | Green |
| | Seizure or convulsion | Green |
| | Loss of consciousness | Green |
| | Deteriorating conscious state | Green |
| | Vomiting | Green |
| | Increasingly restless, agitated or combative | Green |
| | STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface |
| | Balance / gait difficulties / motor coordination | Yellow |
| | Disorientation or confusion | Green |
| | Blank or vacant look | Red |
| | Facial injury after head trauma | Yellow Note pre-injury status |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | Green Hearing can be affected in a small proportion of conditions |
| | Requires understanding | Green |
| | Requires speech | Green |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | |
| Best Eye Response | No eye opening | Yellow Consider bilateral globe absent / may be reliable if one eye affected |
| | Eye opening in response to pain | Yellow Consider bilateral globe absent / may be reliable if one eye affected |
| | Eye opening to speech | Yellow Consider bilateral globe absent / may be reliable if one eye affected |
| | Eye opening spontaneously | Yellow Consider bilateral globe absent / may be reliable if one eye affected |
| Best Verbal Response | No verbal response | Green |
| | Incomprehensible sounds | Green |
| | Inappropriate words | Green |
| | Confused | Green |
| | Oriented | Green |
| Best Motor Response | No motor response | Green |
| | Extension to pain | Green |
| | Abnormal flexion to pain | Green |
| | Flexion / Withdrawal to pain | Green |
| | Localizes to pain | Green |
| | Obeys commands | Green |
| | CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? |
| | Full range of ACTIVE pain free movement? | Green |
| | Is the limb strength and sensation normal? | Green |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in SCI athletes with quadriplegia

| | | | |
|---|--|--|-------|
| STEP 1 RED FLAGS | Neck pain or tenderness | Yellow | |
| | Double Vision | Green | |
| | Weakness or tingling/burning in arms or legs | Yellow | |
| | Severe or increasing headache | Green | |
| | Seizure or convulsion | Green | |
| | Loss of consciousness | Green | |
| | Deteriorating conscious state | Green | |
| | Vomiting | Green | |
| | Increasingly restless, agitated or combative | Green | |
| | STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface | Green |
| | | Balance / gait difficulties / motor coordination | Green |
| Disorientation or confusion | | Green | |
| Blank or vacant look | | Green | |
| Facial injury after head trauma | | Green | |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | Green | |
| | Requires understanding | Green | |
| | Requires speech | Green | |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | | |
| Best Eye Response | No eye opening | Green | |
| | Eye opening in response to pain | Green | |
| | Eye opening to speech | Green | |
| | Eye opening spontaneously | Green | |
| Best Verbal Response | No verbal response | Green | |
| | Incomprehensible sounds | Green | |
| | Inappropriate words | Green | |
| | Confused | Green | |
| | Oriented | Green | |
| Best Motor Response | No motor response | Yellow | |
| | Extension to pain | Yellow | |
| | Abnormal flexion to pain | Yellow | |
| | Flexion / Withdrawal to pain | Yellow | |
| | Localizes to pain | Yellow | |
| | Obeys commands | Green | |
| CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | Yellow | |
| | Full range of ACTIVE pain free movement? | Yellow | |
| | Is the limb strength and sensation normal? | Yellow | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in SCI athletes with paraplegia

| | | |
|---|--|--|
| STEP 1 RED FLAGS | Neck pain or tenderness | Green |
| | Double Vision | Green |
| | Weakness or tingling/burning in arms or legs | Yellow (Consider leg involvement) |
| | Severe or increasing headache | Green |
| | Seizure or convulsion | Green |
| | Loss of consciousness | Green |
| | Deteriorating conscious state | Green |
| | Vomiting | Green |
| | Increasingly restless, agitated or combative | Green |
| | STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface |
| | Balance / gait difficulties / motor coordination | Green |
| | Disorientation or confusion | Green |
| | Blank or vacant look | Green |
| | Facial injury after head trauma | Green |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | Green |
| | Requires understanding | Green |
| | Requires speech | Green |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | |
| Best Eye Response | No eye opening | Green |
| | Eye opening in response to pain | Green |
| | Eye opening to speech | Green |
| | Eye opening spontaneously | Green |
| Best Verbal Response | No verbal response | Green |
| | Incomprehensible sounds | Green |
| | Inappropriate words | Green |
| | Confused | Green |
| | Oriented | Green |
| Best Motor Response | No motor response | Yellow (Lesion level must be noted) |
| | Extension to pain | Yellow (Lesion level must be noted) |
| | Abnormal flexion to pain | Yellow (Lesion level must be noted) |
| | Flexion / Withdrawal to pain | Yellow (Lesion level must be noted) |
| | Localizes to pain | Yellow (Lesion level must be noted) |
| | Obeys commands | Green |
| | CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? |
| | Full range of ACTIVE pain free movement? | Yellow (Lesion level must be noted) |
| | Is the limb strength and sensation normal? | Yellow (Consider lower limb involvement) |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in Cerebral Palsy athletes with spastic diplegia

| | | | |
|---|--|--|---------------------------------------|
| STEP 1 RED FLAGS | Neck pain or tenderness | Green | |
| | Double Vision | Green | |
| | Weakness or tingling/burning in arms or legs | Red | |
| | Severe or increasing headache | Green | |
| | Seizure or convulsion | Yellow Increased risk of epilepsy | |
| | Loss of consciousness | Green | |
| | Deteriorating conscious state | Green | |
| | Vomiting | Green | |
| | Increasingly restless, agitated or combative | Green | |
| | STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface | Green |
| | | Balance / gait difficulties / motor coordination | Red Consider test reliability |
| | | Disorientation or confusion | Yellow Association with impairment |
| Blank or vacant look | | Yellow Consider facial muscle involvement | |
| Facial injury after head trauma | | Green | |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | Green | |
| | Requires understanding | Green | |
| | Requires speech | Green | |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | | |
| Best Eye Response | No eye opening | Green | |
| | Eye opening in response to pain | Green | |
| | Eye opening to speech | Green | |
| | Eye opening spontaneously | Green | |
| Best Verbal Response | No verbal response | Green | |
| | Incomprehensible sounds | Green | |
| | Inappropriate words | Green | |
| | Confused | Green | |
| | Oriented | Green | |
| Best Motor Response | No motor response | Green | |
| | Extension to pain | Yellow | |
| | Abnormal flexion to pain | Yellow | |
| | Flexion / Withdrawal to pain | Yellow | |
| | Localizes to pain | Green | |
| | Obeys commands | Green | |
| CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | Green | |
| | Full range of ACTIVE pain free movement? | Green | |
| | Is the limb strength and sensation normal? | Yellow Consider lower limb involvement | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in Cerebral Palsy athletes with spastic hemiplegia

| | | |
|---|--|---|
| STEP 1 RED FLAGS | Neck pain or tenderness | |
| | Double Vision | |
| | Weakness or tingling/burning in arms or legs | Consider side tested and change in symptoms |
| | Severe or increasing headache | |
| | Seizure or convulsion | Increased risk of epilepsy |
| | Loss of consciousness | |
| | Deteriorating conscious state | |
| | Vomiting | |
| | Increasingly restless, agitated or combative | |
| | | |
| STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface | |
| | Balance / gait difficulties / motor coordination | Consider test reliability |
| | Disorientation or confusion | Association with impairment |
| | Blank or vacant look | Consider facial muscle involvement |
| | Facial injury after head trauma | |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | |
| | Requires understanding | |
| | Requires speech | |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | |
| Best Eye Response | No eye opening | |
| | Eye opening in response to pain | |
| | Eye opening to speech | |
| | Eye opening spontaneously | |
| Best Verbal Response | No verbal response | |
| | Incomprehensible sounds | |
| | Inappropriate words | |
| | Confused | |
| | Oriented | |
| Best Motor Response | No motor response | |
| | Extension to pain | |
| | Abnormal flexion to pain | |
| | Flexion / Withdrawal to pain | |
| | Localizes to pain | |
| | Obeys commands | |
| CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | |
| | Full range of ACTIVE pain free movement? | |
| | Is the limb strength and sensation normal? | Consider lower limb involvement |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in Cerebral Palsy athletes with spastic quadriplegia

| | | | |
|---|--|--|---------------------------------------|
| STEP 1 RED FLAGS | Neck pain or tenderness | Green | |
| | Double Vision | Green | |
| | Weakness or tingling/burning in arms or legs | Red | |
| | Severe or increasing headache | Green | |
| | Seizure or convulsion | Yellow Increased risk of epilepsy | |
| | Loss of consciousness | Green | |
| | Deteriorating conscious state | Green | |
| | Vomiting | Green | |
| | Increasingly restless, agitated or combative | Green | |
| | STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface | Green |
| | | Balance / gait difficulties / motor coordination | Red Consider test reliability |
| | | Disorientation or confusion | Yellow Association with impairment |
| Blank or vacant look | | Yellow Consider facial muscle involvement | |
| Facial injury after head trauma | | Green | |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | Green | |
| | Requires understanding | Green | |
| | Requires speech | Green | |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | | |
| Best Eye Response | No eye opening | Green | |
| | Eye opening in response to pain | Green | |
| | Eye opening to speech | Green | |
| | Eye opening spontaneously | Green | |
| Best Verbal Response | No verbal response | Green | |
| | Incomprehensible sounds | Green | |
| | Inappropriate words | Green | |
| | Confused | Green | |
| | Oriented | Green | |
| Best Motor Response | No motor response | Green | |
| | Extension to pain | Yellow | |
| | Abnormal flexion to pain | Yellow | |
| | Flexion / Withdrawal to pain | Yellow | |
| | Localizes to pain | Green | |
| | Obeys commands | Green | |
| CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | Green | |
| | Full range of ACTIVE pain free movement? | Green | |
| | Is the limb strength and sensation normal? | Yellow Consider lower limb involvement | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in Cerebral Palsy athletes with dyskinetic cerebral palsy

| | | | |
|---|--|---|---------------------------------------|
| STEP 1 RED FLAGS | Neck pain or tenderness | Green | |
| | Double Vision | Yellow | |
| | Weakness or tingling/burning in arms or legs | Red | |
| | Severe or increasing headache | Green | |
| | Seizure or convulsion | Yellow Increased risk of epilepsy | |
| | Loss of consciousness | Green | |
| | Deteriorating conscious state | Green | |
| | Vomiting | Green | |
| | Increasingly restless, agitated or combative | Green | |
| | STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface | Green |
| | | Balance / gait difficulties / motor coordination | Red Consider test reliability |
| | | Disorientation or confusion | Yellow Association with impairment |
| Blank or vacant look | | Yellow Consider facial muscle involvement | |
| Facial injury after head trauma | | Green | |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | Green | |
| | Requires understanding | Green | |
| | Requires speech | Green | |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | | |
| Best Eye Response | No eye opening | Green | |
| | Eye opening in response to pain | Green | |
| | Eye opening to speech | Green | |
| | Eye opening spontaneously | Green | |
| Best Verbal Response | No verbal response | Green | |
| | Incomprehensible sounds | Green | |
| | Inappropriate words | Yellow Consider baseline as speech can be affected | |
| | Confused | Yellow Consider baseline as speech can be affected | |
| | Oriented | Yellow Consider baseline as speech can be affected | |
| Best Motor Response | No motor response | Green | |
| | Extension to pain | Yellow | |
| | Abnormal flexion to pain | Yellow | |
| | Flexion / Withdrawal to pain | Yellow | |
| | Localizes to pain | Green | |
| | Obeys commands | Green | |
| | CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | Green |
| Full range of ACTIVE pain free movement? | | Green | |
| Is the limb strength and sensation normal? | | Yellow Consider lower limb involvement | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in Cerebral Palsy athletes with ataxic cerebral palsy

| | | | |
|---|--|---|--|
| STEP 1 RED FLAGS | Neck pain or tenderness | Green | |
| | Double Vision | Yellow | |
| | Weakness or tingling/burning in arms or legs | Red | |
| | Severe or increasing headache | Green | |
| | Seizure or convulsion | Yellow Increased risk of epilepsy | |
| | Loss of consciousness | Green | |
| | Deteriorating conscious state | Green | |
| | Vomiting | Green | |
| | Increasingly restless, agitated or combative | Green | |
| | STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface | Green |
| | | Balance / gait difficulties / motor coordination | Red Consider test reliability |
| | | Disorientation or confusion | Yellow Association with impairment |
| | | Blank or vacant look | Yellow Consider facial muscle involvement |
| Facial injury after head trauma | | Green | |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | Green | |
| | Requires understanding | Green | |
| | Requires speech | Green | |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | | |
| Best Eye Response | No eye opening | Green | |
| | Eye opening in response to pain | Green | |
| | Eye opening to speech | Green | |
| | Eye opening spontaneously | Green | |
| Best Verbal Response | No verbal response | Green | |
| | Incomprehensible sounds | Green | |
| | Inappropriate words | Yellow Consider baseline as speech can be affected | |
| | Confused | Yellow Consider baseline as speech can be affected | |
| | Oriented | Yellow Consider baseline as speech can be affected | |
| Best Motor Response | No motor response | Green | |
| | Extension to pain | Yellow | |
| | Abnormal flexion to pain | Yellow | |
| | Flexion / Withdrawal to pain | Yellow | |
| | Localizes to pain | Green | |
| | Obeys commands | Green | |
| | CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | Green |
| Full range of ACTIVE pain free movement? | | Green | |
| Is the limb strength and sensation normal? | | Yellow Consider lower limb involvement | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in Cerebral Palsy athletes with mixed cerebral palsy

| | | |
|---|--|---|
| STEP 1 RED FLAGS | Neck pain or tenderness | Green |
| | Double Vision | Yellow |
| | Weakness or tingling/burning in arms or legs | Red |
| | Severe or increasing headache | Green |
| | Seizure or convulsion | Yellow Increased risk of epilepsy |
| | Loss of consciousness | Green |
| | Deteriorating conscious state | Green |
| | Vomiting | Green |
| | Increasingly restless, agitated or combative | Green |
| | STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface |
| | Balance / gait difficulties / motor coordination | Red Consider test reliability |
| | Disorientation or confusion | Yellow Association with impairment |
| | Blank or vacant look | Yellow Consider facial muscle involvement |
| | Facial injury after head trauma | Green |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | Green |
| | Requires understanding | Green |
| | Requires speech | Green |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | |
| Best Eye Response | No eye opening | Green |
| | Eye opening in response to pain | Green |
| | Eye opening to speech | Green |
| | Eye opening spontaneously | Green |
| Best Verbal Response | No verbal response | Green |
| | Incomprehensible sounds | Green |
| | Inappropriate words | Yellow Consider baseline as speech can be affected |
| | Confused | Yellow Consider baseline as speech can be affected |
| | Oriented | Yellow Consider baseline as speech can be affected |
| Best Motor Response | No motor response | Green |
| | Extension to pain | Yellow |
| | Abnormal flexion to pain | Yellow |
| | Flexion / Withdrawal to pain | Yellow |
| | Localizes to pain | Green |
| | Obeys commands | Green |
| | CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? |
| | Full range of ACTIVE pain free movement? | Green |
| | Is the limb strength and sensation normal? | Yellow Consider lower limb involvement |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in athletes with intellectual impairment

| | | | |
|---|--|--|-------|
| STEP 1 RED FLAGS | Neck pain or tenderness | Green | |
| | Double Vision | Green | |
| | Weakness or tingling/burning in arms or legs | Green | |
| | Severe or increasing headache | Green | |
| | Seizure or convulsion | Green | |
| | Loss of consciousness | Green | |
| | Deteriorating conscious state | Green | |
| | Vomiting | Green | |
| | Increasingly restless, agitated or combative | Green | |
| | STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface | Green |
| | | Balance / gait difficulties / motor coordination | Green |
| Disorientation or confusion | | Yellow | |
| Blank or vacant look | | Yellow | |
| Facial injury after head trauma | | Green | |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | Green | |
| | Requires understanding | Yellow | |
| | Requires speech | Green | |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | | |
| Best Eye Response | No eye opening | Green | |
| | Eye opening in response to pain | Green | |
| | Eye opening to speech | Green | |
| | Eye opening spontaneously | Green | |
| Best Verbal Response | No verbal response | Green | |
| | Incomprehensible sounds | Green | |
| | Inappropriate words | Green | |
| | Confused | Green | |
| | Oriented | Green | |
| Best Motor Response | No motor response | Green | |
| | Extension to pain | Green | |
| | Abnormal flexion to pain | Green | |
| | Flexion / Withdrawal to pain | Green | |
| | Localizes to pain | Green | |
| | Obeys commands | Green | |
| | CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | Green |
| Full range of ACTIVE pain free movement? | | Green | |
| Is the limb strength and sensation normal? | | Green | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in athletes with achondroplasia

| | | |
|---|--|---|
| STEP 1 RED FLAGS | Neck pain or tenderness | Increased incidence of atlantoaxial instability |
| | Double Vision | |
| | Weakness or tingling/burning in arms or legs | |
| | Severe or increasing headache | |
| | Seizure or convulsion | |
| | Loss of consciousness | |
| | Deteriorating conscious state | |
| | Vomiting | |
| | Increasingly restless, agitated or combative | |
| | | |
| STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface | |
| | Balance / gait difficulties / motor coordination | |
| | Disorientation or confusion | |
| | Blank or vacant look | |
| | Facial injury after head trauma | |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | |
| | Requires understanding | |
| | Requires speech | |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | |
| Best Eye Response | No eye opening | |
| | Eye opening in response to pain | |
| | Eye opening to speech | |
| | Eye opening spontaneously | |
| Best Verbal Response | No verbal response | |
| | Incomprehensible sounds | |
| | Inappropriate words | |
| | Confused | |
| | Oriented | |
| Best Motor Response | No motor response | |
| | Extension to pain | |
| | Abnormal flexion to pain | |
| | Flexion / Withdrawal to pain | |
| | Localizes to pain | |
| | Obeys commands | |
| CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | Increased incidence of atlantoaxial instability |
| | Full range of ACTIVE pain free movement? | Increased incidence of atlantoaxial instability |
| | Is the limb strength and sensation normal? | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in athletes with arthrogyriposis

| | | |
|---|--|--|
| STEP 1 RED FLAGS | Neck pain or tenderness | |
| | Double Vision | |
| | Weakness or tingling/burning in arms or legs | Weakness may be hard to assess given reduced joint ROM |
| | Severe or increasing headache | |
| | Seizure or convulsion | |
| | Loss of consciousness | |
| | Deteriorating conscious state | |
| | Vomiting | |
| | Increasingly restless, agitated or combative | |
| | | |
| STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface | |
| | Balance / gait difficulties / motor coordination | Gait affected in those with LE manifestations |
| | Disorientation or confusion | |
| | Blank or vacant look | |
| | Facial injury after head trauma | |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | |
| | Requires understanding | |
| | Requires speech | |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | |
| Best Eye Response | No eye opening | |
| | Eye opening in response to pain | |
| | Eye opening to speech | |
| | Eye opening spontaneously | |
| Best Verbal Response | No verbal response | |
| | Incomprehensible sounds | |
| | Inappropriate words | |
| | Confused | |
| | Oriented | |
| Best Motor Response | No motor response | |
| | Extension to pain | May be altered due to reduced joint ROM |
| | Abnormal flexion to pain | May be altered due to reduced joint ROM |
| | Flexion / Withdrawal to pain | May be altered due to reduced joint ROM |
| | Localizes to pain | May be altered due to reduced joint ROM |
| | Obeys commands | |
| CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | |
| | Full range of ACTIVE pain free movement? | |
| | Is the limb strength and sensation normal? | Weakness may be hard to assess given reduced joint ROM |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in athletes with polio

| | | |
|---|--|---|
| STEP 1 RED FLAGS | Neck pain or tenderness | |
| | Double Vision | |
| | Weakness or tingling/burning in arms or legs | Likely to have baseline weakness (less likely tingling/burning) |
| | Severe or increasing headache | |
| | Seizure or convulsion | |
| | Loss of consciousness | |
| | Deteriorating conscious state | |
| | Vomiting | |
| | Increasingly restless, agitated or combative | |
| | | |
| STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface | |
| | Balance / gait difficulties / motor coordination | Gait abnormality dependent on muscles affected |
| | Disorientation or confusion | |
| | Blank or vacant look | |
| | Facial injury after head trauma | |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | |
| | Requires understanding | |
| | Requires speech | |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | |
| Best Eye Response | No eye opening | |
| | Eye opening in response to pain | |
| | Eye opening to speech | |
| | Eye opening spontaneously | |
| Best Verbal Response | No verbal response | |
| | Incomprehensible sounds | |
| | Inappropriate words | |
| | Confused | |
| | Oriented | |
| Best Motor Response | No motor response | Dependent on which muscles affected |
| | Extension to pain | Dependent on which muscles affected |
| | Abnormal flexion to pain | Dependent on which muscles affected |
| | Flexion / Withdrawal to pain | Dependent on which muscles affected |
| | Localizes to pain | Dependent on which muscles affected |
| | Obeys commands | |
| | | |
| CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | |
| | Full range of ACTIVE pain free movement? | |
| | Is the limb strength and sensation normal? | Dependent on which muscles affected |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in athletes with muscular dystrophy

| | | |
|---|--|--|
| STEP 1 RED FLAGS | Neck pain or tenderness | |
| | Double Vision | Vision can be affected in OPMD |
| | Weakness or tingling/burning in arms or legs | Peripheral strength affected in several forms of MD |
| | Severe or increasing headache | |
| | Seizure or convulsion | |
| | Loss of consciousness | |
| | Deteriorating conscious state | |
| | Vomiting | |
| | Increasingly restless, agitated or combative | |
| | | |
| STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface | |
| | Balance / gait difficulties / motor coordination | Peripheral strength affected in several forms of MD |
| | Disorientation or confusion | |
| | Blank or vacant look | |
| | Facial injury after head trauma | |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | Hearing can be affected |
| | Requires understanding | |
| | Requires speech | Oropharyngeal strength and speech affected in DMD and OPMD |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | |
| Best Eye Response | No eye opening | |
| | Eye opening in response to pain | Ptosis can be seen in OPMD |
| | Eye opening to speech | Ptosis can be seen in OPMD |
| | Eye opening spontaneously | Ptosis can be seen in OPMD |
| Best Verbal Response | No verbal response | |
| | Incomprehensible sounds | Oropharyngeal strength and speech affected in DMD and OPMD |
| | Inappropriate words | Oropharyngeal strength and speech affected in DMD and OPMD |
| | Confused | Oropharyngeal strength and speech affected in DMD and OPMD |
| | Oriented | Oropharyngeal strength and speech affected in DMD and OPMD |
| Best Motor Response | No motor response | |
| | Extension to pain | May be altered due to muscle weakness |
| | Abnormal flexion to pain | May be altered due to muscle weakness |
| | Flexion / Withdrawal to pain | May be altered due to muscle weakness |
| | Localizes to pain | May be altered due to muscle weakness |
| | Obeys commands | May be altered due to muscle weakness |
| CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | |
| | Full range of ACTIVE pain free movement? | |
| | Is the limb strength and sensation normal? | Peripheral strength affected in several forms of MD |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in athletes with multiple sclerosis

| | | |
|---|--|---|
| STEP 1 RED FLAGS | Neck pain or tenderness | |
| | Double Vision | Vision can be affected in MS |
| | Weakness or tingling/burning in arms or legs | Likely to have baseline weakness as primary manifestation of MS |
| | Severe or increasing headache | Headaches can be seen in MS, especially if high burden of brain lesions |
| | Seizure or convulsion | |
| | Loss of consciousness | |
| | Deteriorating conscious state | |
| | Vomiting | |
| | Increasingly restless, agitated or combative | |
| | STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface |
| Balance / gait difficulties / motor coordination | | Peripheral strength and gait typically affected in MS |
| Disorientation or confusion | | |
| Blank or vacant look | | |
| Facial injury after head trauma | | |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | |
| | Requires understanding | |
| | Requires speech | Dysarthria common |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | |
| Best Eye Response | No eye opening | |
| | Eye opening in response to pain | Ptosis can be seen in MS |
| | Eye opening to speech | Ptosis can be seen in MS |
| | Eye opening spontaneously | Ptosis can be seen in MS |
| Best Verbal Response | No verbal response | |
| | Incomprehensible sounds | Dysarthria common |
| | Inappropriate words | Dysarthria common |
| | Confused | Dysarthria common |
| | Oriented | Dysarthria common |
| Best Motor Response | No motor response | |
| | Extension to pain | Peripheral strength/sensation affected in MS |
| | Abnormal flexion to pain | Peripheral strength/sensation affected in MS |
| | Flexion / Withdrawal to pain | Peripheral strength/sensation affected in MS |
| | Localizes to pain | Peripheral strength/sensation affected in MS |
| | Obeys commands | |
| | CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? |
| Full range of ACTIVE pain free movement? | | |
| Is the limb strength and sensation normal? | | Peripheral strength/sensation affected in MS |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the immediate or on-field assessment in athletes with spina bifida

| | | |
|---|--|---|
| STEP 1 RED FLAGS | Neck pain or tenderness | |
| | Double Vision | |
| | Weakness or tingling/burning in arms or legs | Due to spinal cord lesion |
| | Severe or increasing headache | Headaches can be seen in SB, especially if chronic hydrocephalus |
| | Seizure or convulsion | Seizure can be seen in SB especially if chronic hydrocephalus/shunt |
| | Loss of consciousness | |
| | Deteriorating conscious state | Also a symptom of hydrocephalus |
| | Vomiting | Also a symptom of hydrocephalus |
| | Increasingly restless, agitated or combative | |
| | | |
| STEP 2 OBSERVABLE SIGNS | Lying motionless on the playing surface | |
| | Balance / gait difficulties / motor coordination | Consider spinal cord lesion |
| | Disorientation or confusion | Also a symptom of hydrocephalus |
| | Blank or vacant look | Also a symptom of hydrocephalus |
| | Facial injury after head trauma | |
| STEP 3 MEMORY ASSESSMENT MADDOCKS QUESTIONS | Requires hearing | |
| | Requires understanding | |
| | Requires speech | |
| STEP 4 ASSESSMENT OF GLASGOW COMA SCALE (SCORE/15) | | |
| Best Eye Response | No eye opening | |
| | Eye opening in response to pain | |
| | Eye opening to speech | |
| | Eye opening spontaneously | |
| Best Verbal Response | No verbal response | |
| | Incomprehensible sounds | |
| | Inappropriate words | |
| | Confused | |
| | Oriented | |
| Best Motor Response | No motor response | |
| | Extension to pain | LE strength affected in SB; UE motor testing likely normal |
| | Abnormal flexion to pain | LE strength affected in SB; UE motor testing likely normal |
| | Flexion / Withdrawal to pain | LE strength affected in SB; UE motor testing likely normal |
| | Localizes to pain | LE strength affected in SB; UE motor testing likely normal |
| | Obeys commands | |
| | | |
| CERVICAL SPINE ASSESSMENT | Is the neck pain free at rest? | |
| | Full range of ACTIVE pain free movement? | |
| | Is the limb strength and sensation normal? | Consider spinal cord lesion |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in athletes with (single) upper limb deficiency

| | | |
|--|--|--------------------------|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | <input type="checkbox"/> |
| | Headache disorder or migraines? | <input type="checkbox"/> |
| | Learning disability / dyslexia? | <input type="checkbox"/> |
| | ADD / ADHD? | <input type="checkbox"/> |
| | Depression, anxiety or other psychiatric disorder? | <input type="checkbox"/> |
| STEP 2 SYMPTOM EVALUATION | Headache | <input type="checkbox"/> |
| | “Pressure in head” | <input type="checkbox"/> |
| | Neck pain | <input type="checkbox"/> |
| | Nausea or vomiting | <input type="checkbox"/> |
| | Dizziness | <input type="checkbox"/> |
| | Blurred vision | <input type="checkbox"/> |
| | Balance problems | <input type="checkbox"/> |
| | Sensitivity to light | <input type="checkbox"/> |
| | Sensitivity to noise | <input type="checkbox"/> |
| | Feeling slowed down | <input type="checkbox"/> |
| | Feeling like “in a fog” | <input type="checkbox"/> |
| | “Don’t feel right” | <input type="checkbox"/> |
| | Difficulty concentrating | <input type="checkbox"/> |
| | Difficulty remembering | <input type="checkbox"/> |
| | Fatigue or low energy | <input type="checkbox"/> |
| | Confusion | <input type="checkbox"/> |
| | Drowsiness | <input type="checkbox"/> |
| | More emotional | <input type="checkbox"/> |
| | Irritability | <input type="checkbox"/> |
| | Sadness | <input type="checkbox"/> |
| Nervous or anxious | <input type="checkbox"/> | |
| Trouble falling asleep | <input type="checkbox"/> | |
| Symptoms get worse with physical activity? | <input type="checkbox"/> | |
| Symptoms get worse with mental activity? | <input type="checkbox"/> | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | <input type="checkbox"/> | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | <input type="checkbox"/> |
| | Today’s date | <input type="checkbox"/> |
| | Weekday | <input type="checkbox"/> |
| | Current year | <input type="checkbox"/> |
| | Current time (within 1 hour) | <input type="checkbox"/> |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | <input type="checkbox"/> |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | <input type="checkbox"/> |
| | Repeat a string of numbers in reverse order | <input type="checkbox"/> |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | <input type="checkbox"/> |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | <input type="checkbox"/> |
| | Full range of pain-free PASSIVE cervical spine movement | <input type="checkbox"/> |
| | (fixed head) Look side-to-side and up-and-down | <input type="checkbox"/> |

| | | |
|---|---|--|
| | Perform finger nose coordination test normally | |
| | Perform tandem gait normally | |
| BALANCE EXAMINATION | Double leg stance | |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | |
| | Tandem stance (non-dominant foot at back) | |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in athletes with (bilateral) upper limb deficiency

| | | |
|--|--|--------------------------|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | <input type="checkbox"/> |
| | Headache disorder or migraines? | <input type="checkbox"/> |
| | Learning disability / dyslexia? | <input type="checkbox"/> |
| | ADD / ADHD? | <input type="checkbox"/> |
| | Depression, anxiety or other psychiatric disorder? | <input type="checkbox"/> |
| STEP 2 SYMPTOM EVALUATION | Headache | <input type="checkbox"/> |
| | “Pressure in head” | <input type="checkbox"/> |
| | Neck pain | <input type="checkbox"/> |
| | Nausea or vomiting | <input type="checkbox"/> |
| | Dizziness | <input type="checkbox"/> |
| | Blurred vision | <input type="checkbox"/> |
| | Balance problems | <input type="checkbox"/> |
| | Sensitivity to light | <input type="checkbox"/> |
| | Sensitivity to noise | <input type="checkbox"/> |
| | Feeling slowed down | <input type="checkbox"/> |
| | Feeling like “in a fog” | <input type="checkbox"/> |
| | “Don’t feel right” | <input type="checkbox"/> |
| | Difficulty concentrating | <input type="checkbox"/> |
| | Difficulty remembering | <input type="checkbox"/> |
| | Fatigue or low energy | <input type="checkbox"/> |
| | Confusion | <input type="checkbox"/> |
| | Drowsiness | <input type="checkbox"/> |
| | More emotional | <input type="checkbox"/> |
| | Irritability | <input type="checkbox"/> |
| | Sadness | <input type="checkbox"/> |
| | Nervous or anxious | <input type="checkbox"/> |
| | Trouble falling asleep | <input type="checkbox"/> |
| Symptoms get worse with physical activity? | <input type="checkbox"/> | |
| Symptoms get worse with mental activity? | <input type="checkbox"/> | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | <input type="checkbox"/> | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | <input type="checkbox"/> |
| | Today’s date | <input type="checkbox"/> |
| | Weekday | <input type="checkbox"/> |
| | Current year | <input type="checkbox"/> |
| | Current time (within 1 hour) | <input type="checkbox"/> |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | <input type="checkbox"/> |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | <input type="checkbox"/> |
| | Repeat a string of numbers in reverse order | <input type="checkbox"/> |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | <input type="checkbox"/> |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | <input type="checkbox"/> |
| | Full range of pain-free PASSIVE cervical spine movement | <input type="checkbox"/> |
| | (fixed head) Look side-to-side and up-and-down | <input type="checkbox"/> |

| | | |
|---|---|--|
| | Perform finger nose coordination test normally | |
| | Perform tandem gait normally | |
| BALANCE EXAMINATION | Double leg stance | |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | |
| | Tandem stance (non-dominant foot at back) | |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in athletes with (single) lower limb deficiency

| | | |
|--|--|--------------------------|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | <input type="checkbox"/> |
| | Headache disorder or migraines? | <input type="checkbox"/> |
| | Learning disability / dyslexia? | <input type="checkbox"/> |
| | ADD / ADHD? | <input type="checkbox"/> |
| | Depression, anxiety or other psychiatric disorder? | <input type="checkbox"/> |
| STEP 2 SYMPTOM EVALUATION | Headache | <input type="checkbox"/> |
| | “Pressure in head” | <input type="checkbox"/> |
| | Neck pain | <input type="checkbox"/> |
| | Nausea or vomiting | <input type="checkbox"/> |
| | Dizziness | <input type="checkbox"/> |
| | Blurred vision | <input type="checkbox"/> |
| | Balance problems | <input type="checkbox"/> |
| | Sensitivity to light | <input type="checkbox"/> |
| | Sensitivity to noise | <input type="checkbox"/> |
| | Feeling slowed down | <input type="checkbox"/> |
| | Feeling like “in a fog” | <input type="checkbox"/> |
| | “Don’t feel right” | <input type="checkbox"/> |
| | Difficulty concentrating | <input type="checkbox"/> |
| | Difficulty remembering | <input type="checkbox"/> |
| | Fatigue or low energy | <input type="checkbox"/> |
| | Confusion | <input type="checkbox"/> |
| | Drowsiness | <input type="checkbox"/> |
| | More emotional | <input type="checkbox"/> |
| | Irritability | <input type="checkbox"/> |
| | Sadness | <input type="checkbox"/> |
| Nervous or anxious | <input type="checkbox"/> | |
| Trouble falling asleep | <input type="checkbox"/> | |
| Symptoms get worse with physical activity? | <input type="checkbox"/> | |
| Symptoms get worse with mental activity? | <input type="checkbox"/> | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | <input type="checkbox"/> | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | <input type="checkbox"/> |
| | Today’s date | <input type="checkbox"/> |
| | Weekday | <input type="checkbox"/> |
| | Current year | <input type="checkbox"/> |
| | Current time (within 1 hour) | <input type="checkbox"/> |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | <input type="checkbox"/> |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | <input type="checkbox"/> |
| | Repeat a string of numbers in reverse order | <input type="checkbox"/> |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | <input type="checkbox"/> |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | <input type="checkbox"/> |
| | Full range of pain-free PASSIVE cervical spine movement | <input type="checkbox"/> |
| | (fixed head) Look side-to-side and up-and-down | <input type="checkbox"/> |

| | | |
|---|---|------------------------|
| | Perform finger nose coordination test normally | |
| | Perform tandem gait normally | |
| BALANCE EXAMINATION | Double leg stance | Test in day prosthetic |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | Test in day prosthetic |
| | Tandem stance (non-dominant foot at back) | Test in day prosthetic |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in athletes with (bilateral) lower limb deficiency

| | | |
|--|--|-----------------------------|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | |
| | Headache disorder or migraines? | |
| | Learning disability / dyslexia? | |
| | ADD / ADHD? | |
| | Depression, anxiety or other psychiatric disorder? | |
| STEP 2 SYMPTOM EVALUATION | Headache | |
| | “Pressure in head” | |
| | Neck pain | |
| | Nausea or vomiting | |
| | Dizziness | |
| | Blurred vision | |
| | Balance problems | Consider looking for change |
| | Sensitivity to light | |
| | Sensitivity to noise | |
| | Feeling slowed down | |
| | Feeling like “in a fog” | |
| | “Don’t feel right” | |
| | Difficulty concentrating | |
| | Difficulty remembering | |
| | Fatigue or low energy | |
| | Confusion | |
| | Drowsiness | |
| | More emotional | |
| | Irritability | |
| | Sadness | |
| | Nervous or anxious | |
| | Trouble falling asleep | |
| Symptoms get worse with physical activity? | | |
| Symptoms get worse with mental activity? | | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | |
| | Today’s date | |
| | Weekday | |
| | Current year | |
| | Current time (within 1 hour) | |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | |
| | Repeat a string of numbers in reverse order | |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | |
| | Full range of pain-free PASSIVE cervical spine movement | |
| | (fixed head) Look side-to-side and up-and-down | |

| | | |
|---|---|---|
| | Perform finger nose coordination test normally | |
| | Perform tandem gait normally | |
| BALANCE EXAMINATION | Double leg stance | Test in day prosthetic or no prosthetic |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | Test in day prosthetic or no prosthetic |
| | Tandem stance (non-dominant foot at back) | Test in day prosthetic or no prosthetic |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in athletes with impaired vision

| | | |
|---|--|-----------------------------------|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | Green |
| | Headache disorder or migraines? | Green |
| | Learning disability / dyslexia? | Green |
| | ADD / ADHD? | Green |
| | Depression, anxiety or other psychiatric disorder? | Green |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | Consider translator/screen reader |
| | Headache | Green |
| | “Pressure in head” | Green |
| | Neck pain | Green |
| | Nausea or vomiting | Green |
| | Dizziness | Green |
| | Blurred vision | Yellow |
| | Balance problems | Yellow |
| | Sensitivity to light | Yellow |
| | Sensitivity to noise | Green |
| | Feeling slowed down | Green |
| | Feeling like “in a fog” | Green |
| | “Don’t feel right” | Green |
| | Difficulty concentrating | Green |
| | Difficulty remembering | Green |
| | Fatigue or low energy | Green |
| | Confusion | Green |
| | Drowsiness | Green |
| | More emotional | Green |
| | Irritability | Green |
| Sadness | Green | |
| Nervous or anxious | Green | |
| Trouble falling asleep | Green | |
| Symptoms get worse with physical activity? | Green | |
| Symptoms get worse with mental activity? | Green | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | Green | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | Green |
| | Today’s date | Green |
| | Weekday | Green |
| | Current year | Green |
| | Current time (within 1 hour) | Green |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | Green |
| | Repeat a string of numbers | Green |
| CONCENTRATION – Digits backwards | Repeat a string of numbers in reverse order | Green |
| | Tell the months of the year in reverse order | Green |
| MONTHS IN REVERSE ORDER | | |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | Red |
| | Full range of pain-free PASSIVE cervical spine movement | Green |
| | (fixed head) Look side-to-side and up-and-down | Yellow |

| | | |
|---|---|--------------------------|
| | Perform finger nose coordination test normally | Baseline may be an issue |
| | Perform tandem gait normally | Baseline may be lower |
| BALANCE EXAMINATION | Double leg stance | Baseline may be lower |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | Baseline may be lower |
| | Tandem stance (non-dominant foot at back) | Baseline may be lower |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in athletes with absent vision

| | | |
|---|--|-----------------------------------|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | Green |
| | Headache disorder or migraines? | Green |
| | Learning disability / dyslexia? | Green |
| | ADD / ADHD? | Green |
| | Depression, anxiety or other psychiatric disorder? | Green |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | Consider translator/screen reader |
| | Headache | Green |
| | “Pressure in head” | Green |
| | Neck pain | Green |
| | Nausea or vomiting | Green |
| | Dizziness | Green |
| | Blurred vision | Yellow |
| | Balance problems | Yellow |
| | Sensitivity to light | Yellow |
| | Sensitivity to noise | Green |
| | Feeling slowed down | Green |
| | Feeling like “in a fog” | Green |
| | “Don’t feel right” | Green |
| | Difficulty concentrating | Green |
| | Difficulty remembering | Green |
| | Fatigue or low energy | Green |
| | Confusion | Green |
| | Drowsiness | Green |
| | More emotional | Green |
| | Irritability | Green |
| Sadness | Green | |
| Nervous or anxious | Green | |
| Trouble falling asleep | Yellow | |
| Symptoms get worse with physical activity? | Green | |
| Symptoms get worse with mental activity? | Green | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | Green | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | Green |
| | Today’s date | Green |
| | Weekday | Green |
| | Current year | Green |
| | Current time (within 1 hour) | Green |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | Green |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | Green |
| | Repeat a string of numbers in reverse order | Green |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | Green |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | Red |
| | Full range of pain-free PASSIVE cervical spine movement | Green |
| | (fixed head) Look side-to-side and up-and-down | Red |

| | | |
|---|---|-----------------------|
| | Perform finger nose coordination test normally | Baseline may be lower |
| | Perform tandem gait normally | Baseline may be lower |
| BALANCE EXAMINATION | Double leg stance | Baseline may be lower |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | Baseline may be lower |
| | Tandem stance (non-dominant foot at back) | Baseline may be lower |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in athletes with globe absent

| | | |
|---|--|-----------------------------------|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | |
| | Headache disorder or migraines? | |
| | Learning disability / dyslexia? | |
| | ADD / ADHD? | |
| | Depression, anxiety or other psychiatric disorder? | |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | Consider translator/screen reader |
| | Headache | |
| | “Pressure in head” | |
| | Neck pain | |
| | Nausea or vomiting | |
| | Dizziness | |
| | Blurred vision | |
| | Balance problems | |
| | Sensitivity to light | |
| | Sensitivity to noise | |
| | Feeling slowed down | |
| | Feeling like “in a fog” | |
| | “Don’t feel right” | |
| | Difficulty concentrating | |
| | Difficulty remembering | |
| | Fatigue or low energy | |
| | Confusion | |
| | Drowsiness | |
| | More emotional | |
| | Irritability | |
| | Sadness | |
| Nervous or anxious | | |
| Trouble falling asleep | Consider if unilateral or bilateral | |
| Symptoms get worse with physical activity? | | |
| Symptoms get worse with mental activity? | | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | |
| | Today’s date | |
| | Weekday | |
| | Current year | |
| | Current time (within 1 hour) | |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | |
| | Repeat a string of numbers | |
| CONCENTRATION – Digits backwards | Repeat a string of numbers in reverse order | |
| | Tell the months of the year in reverse order | |
| MONTHS IN REVERSE ORDER | | |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | |
| | Full range of pain-free PASSIVE cervical spine movement | |
| | (fixed head) Look side-to-side and up-and-down | |

| | | |
|---|---|-----------------------|
| | Perform finger nose coordination test normally | Baseline may be lower |
| | Perform tandem gait normally | Baseline may be lower |
| BALANCE EXAMINATION | Double leg stance | Baseline may be lower |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | Baseline may be lower |
| | Tandem stance (non-dominant foot at back) | Baseline may be lower |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in SCI athletes with quadriplegia

| | | |
|---|--|------------------------------------|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | Consider initial injury |
| | Headache disorder or migraines? | |
| | Learning disability / dyslexia? | |
| | ADD / ADHD? | |
| | Depression, anxiety or other psychiatric disorder? | |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | |
| | Headache | |
| | "Pressure in head" | |
| | Neck pain | |
| | Nausea or vomiting | |
| | Dizziness | |
| | Blurred vision | |
| | Balance problems | Consider reporting sitting balance |
| | Sensitivity to light | |
| | Sensitivity to noise | |
| | Feeling slowed down | |
| | Feeling like "in a fog" | |
| | "Don't feel right" | |
| | Difficulty concentrating | |
| | Difficulty remembering | |
| | Fatigue or low energy | |
| | Confusion | |
| | Drowsiness | |
| | More emotional | |
| | Irritability | |
| | Sadness | |
| | Nervous or anxious | |
| | Trouble falling asleep | |
| Symptoms get worse with physical activity? | | |
| Symptoms get worse with mental activity? | | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | |
| | Today's date | |
| | Weekday | |
| | Current year | |
| | Current time (within 1 hour) | |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | |
| | Repeat a string of numbers in reverse order | |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | |
| | Full range of pain-free PASSIVE cervical spine movement (fixed head) Look side-to-side and up-and-down | Comparative to baseline |
| | | |

| | | |
|---|---|-------------------------------|
| | Perform finger nose coordination test normally | Hand function may be affected |
| | Perform tandem gait normally | |
| BALANCE EXAMINATION | Double leg stance | |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | |
| | Tandem stance (non-dominant foot at back) | |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in SCI athletes with paraplegia

| | | |
|---|--|------------------------------------|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | Consider initial injury |
| | Headache disorder or migraines? | |
| | Learning disability / dyslexia? | |
| | ADD / ADHD? | |
| | Depression, anxiety or other psychiatric disorder? | |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | |
| | Headache | |
| | "Pressure in head" | |
| | Neck pain | |
| | Nausea or vomiting | |
| | Dizziness | |
| | Blurred vision | |
| | Balance problems | Consider reporting sitting balance |
| | Sensitivity to light | |
| | Sensitivity to noise | |
| | Feeling slowed down | |
| | Feeling like "in a fog" | |
| | "Don't feel right" | |
| | Difficulty concentrating | |
| | Difficulty remembering | |
| | Fatigue or low energy | |
| | Confusion | |
| | Drowsiness | |
| | More emotional | |
| | Irritability | |
| | Sadness | |
| | Nervous or anxious | |
| | Trouble falling asleep | |
| Symptoms get worse with physical activity? | | |
| Symptoms get worse with mental activity? | | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | |
| | Today's date | |
| | Weekday | |
| | Current year | |
| | Current time (within 1 hour) | |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | |
| | Repeat a string of numbers in reverse order | |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | |
| | Full range of pain-free PASSIVE cervical spine movement | |
| | (fixed head) Look side-to-side and up-and-down | |

| | | |
|---|---|--|
| | Perform finger nose coordination test normally | |
| | Perform tandem gait normally | |
| BALANCE EXAMINATION | Double leg stance | |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | |
| | Tandem stance (non-dominant foot at back) | |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in Cerebral Palsy athletes with spastic diplegia

| | | |
|---|--|---|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | |
| | Headache disorder or migraines? | |
| | Learning disability / dyslexia? | Increased risk |
| | ADD / ADHD? | Increased risk |
| | Depression, anxiety or other psychiatric disorder? | |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | Consider if accompanying person required/modify descriptive words |
| | Headache | |
| | “Pressure in head” | |
| | Neck pain | Consider baseline |
| | Nausea or vomiting | |
| | Dizziness | |
| | Blurred vision | Increased risk |
| | Balance problems | |
| | Sensitivity to light | |
| | Sensitivity to noise | |
| | Feeling slowed down | |
| | Feeling like “in a fog” | |
| | “Don’t feel right” | |
| | Difficulty concentrating | Reflect on values over time |
| | Difficulty remembering | Reflect on values over time |
| | Fatigue or low energy | |
| | Confusion | |
| | Drowsiness | |
| | More emotional | |
| | Irritability | |
| | Sadness | |
| Nervous or anxious | | |
| Trouble falling asleep | | |
| Symptoms get worse with physical activity? | | |
| Symptoms get worse with mental activity? | | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | |
| | Today’s date | |
| | Weekday | |
| | Current year | |
| | Current time (within 1 hour) | |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | Can tester interpret/LD association |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | Can tester interpret/LD association |
| | Repeat a string of numbers in reverse order | Can tester interpret/LD association |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | Can tester interpret/LD association |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | Increased risk |
| | Full range of pain-free PASSIVE cervical spine movement | Comparative to baseline |

| | | |
|---|---|---|
| | (fixed head) Look side-to-side and up-and-down | |
| | Perform finger nose coordination test normally | Hand function may be affected |
| | Perform tandem gait normally | Leg function may be affected |
| BALANCE EXAMINATION | Double leg stance | |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | |
| | Tandem stance (non-dominant foot at back) | |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | Consider association with learning disability |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in Cerebral Palsy athletes with spastic hemiplegia

| | | |
|---|--|---|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | |
| | Headache disorder or migraines? | |
| | Learning disability / dyslexia? | Increased risk |
| | ADD / ADHD? | Increased risk |
| | Depression, anxiety or other psychiatric disorder? | |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | Consider if accompanying person required/modify descriptive words |
| | Headache | |
| | “Pressure in head” | |
| | Neck pain | Consider baseline |
| | Nausea or vomiting | |
| | Dizziness | |
| | Blurred vision | Increased risk |
| | Balance problems | |
| | Sensitivity to light | |
| | Sensitivity to noise | |
| | Feeling slowed down | |
| | Feeling like “in a fog” | |
| | “Don’t feel right” | |
| | Difficulty concentrating | Reflect on values over time |
| | Difficulty remembering | Reflect on values over time |
| | Fatigue or low energy | |
| | Confusion | |
| | Drowsiness | |
| | More emotional | |
| | Irritability | |
| | Sadness | |
| | Nervous or anxious | |
| Trouble falling asleep | | |
| Symptoms get worse with physical activity? | | |
| Symptoms get worse with mental activity? | | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | |
| | Today’s date | |
| | Weekday | |
| | Current year | |
| | Current time (within 1 hour) | |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | Can tester interpret/LD association |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | Can tester interpret/LD association |
| | Repeat a string of numbers in reverse order | Can tester interpret/LD association |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | Can tester interpret/LD association |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | Increased risk |
| | Full range of pain-free PASSIVE cervical spine movement | Comparative to baseline |

| | | |
|---|---|--|
| | (fixed head) Look side-to-side and up-and-down | |
| | Perform finger nose coordination test normally | Hand function not affected if use unaffected arm |
| | Perform tandem gait normally | Leg function will be affected |
| BALANCE EXAMINATION | Double leg stance | |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | |
| | Tandem stance (non-dominant foot at back) | |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | Consider association with learning disability |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in Cerebral Palsy athletes with spastic quadriplegia

| | | |
|---|--|---|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | |
| | Headache disorder or migraines? | |
| | Learning disability / dyslexia? | Increased risk |
| | ADD / ADHD? | Increased risk |
| | Depression, anxiety or other psychiatric disorder? | |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | Consider if accompanying person required/modify descriptive words |
| | Headache | |
| | “Pressure in head” | |
| | Neck pain | Consider baseline |
| | Nausea or vomiting | |
| | Dizziness | |
| | Blurred vision | Increased risk |
| | Balance problems | |
| | Sensitivity to light | |
| | Sensitivity to noise | |
| | Feeling slowed down | |
| | Feeling like “in a fog” | |
| | “Don’t feel right” | |
| | Difficulty concentrating | Reflect on values over time |
| | Difficulty remembering | Reflect on values over time |
| | Fatigue or low energy | |
| | Confusion | |
| | Drowsiness | |
| | More emotional | |
| | Irritability | |
| | Sadness | |
| Nervous or anxious | | |
| Trouble falling asleep | | |
| Symptoms get worse with physical activity? | | |
| Symptoms get worse with mental activity? | | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | |
| | Today’s date | |
| | Weekday | |
| | Current year | |
| | Current time (within 1 hour) | |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | Can tester interpret/LD association |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | Can tester interpret/LD association |
| | Repeat a string of numbers in reverse order | Can tester interpret/LD association |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | Can tester interpret/LD association |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | Increased risk |
| | Full range of pain-free PASSIVE cervical spine movement | Comparative to baseline |

| | | |
|---|---|---|
| | (fixed head) Look side-to-side and up-and-down | |
| | Perform finger nose coordination test normally | Hand function may be affected |
| | Perform tandem gait normally | Leg function will be affected |
| BALANCE EXAMINATION | Double leg stance | |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | |
| | Tandem stance (non-dominant foot at back) | |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | Consider association with learning disability |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in Cerebral Palsy athletes with dyskinetic cerebral palsy

| | | |
|---|--|---|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | |
| | Headache disorder or migraines? | |
| | Learning disability / dyslexia? | Increased risk |
| | ADD / ADHD? | Increased risk |
| | Depression, anxiety or other psychiatric disorder? | |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | Consider if accompanying person required/modify descriptive words |
| | Headache | |
| | “Pressure in head” | |
| | Neck pain | Consider baseline |
| | Nausea or vomiting | |
| | Dizziness | |
| | Blurred vision | Increased risk |
| | Balance problems | |
| | Sensitivity to light | |
| | Sensitivity to noise | |
| | Feeling slowed down | |
| | Feeling like “in a fog” | |
| | “Don’t feel right” | |
| | Difficulty concentrating | Reflect on values over time |
| | Difficulty remembering | Reflect on values over time |
| | Fatigue or low energy | |
| | Confusion | |
| | Drowsiness | |
| | More emotional | |
| | Irritability | |
| | Sadness | |
| | Nervous or anxious | |
| | Trouble falling asleep | |
| Symptoms get worse with physical activity? | | |
| Symptoms get worse with mental activity? | | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | Can tester interpret/LD association |
| | Today’s date | Can tester interpret/LD association |
| | Weekday | Can tester interpret/LD association |
| | Current year | Can tester interpret/LD association |
| | Current time (within 1 hour) | Can tester interpret/LD association |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | Can tester interpret/LD association |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | Can tester interpret/LD association |
| | Repeat a string of numbers in reverse order | Can tester interpret/LD association |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | Can tester interpret/LD association |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | Increased risk |
| | Full range of pain-free PASSIVE cervical spine movement | Comparative to baseline |

| | | |
|---|---|---|
| | (fixed head) Look side-to-side and up-and-down | |
| | Perform finger nose coordination test normally | Hand function may be affected |
| | Perform tandem gait normally | Leg function will be affected |
| BALANCE EXAMINATION | Double leg stance | |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | |
| | Tandem stance (non-dominant foot at back) | |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | Consider association with learning disability |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in Cerebral Palsy athletes with ataxic cerebral palsy

| | | |
|---|--|---|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | |
| | Headache disorder or migraines? | |
| | Learning disability / dyslexia? | Increased risk |
| | ADD / ADHD? | Increased risk |
| | Depression, anxiety or other psychiatric disorder? | |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | Consider if accompanying person required/modify descriptive words |
| | Headache | |
| | “Pressure in head” | |
| | Neck pain | Consider baseline |
| | Nausea or vomiting | |
| | Dizziness | |
| | Blurred vision | Increased risk |
| | Balance problems | |
| | Sensitivity to light | |
| | Sensitivity to noise | |
| | Feeling slowed down | |
| | Feeling like “in a fog” | |
| | “Don’t feel right” | |
| | Difficulty concentrating | Reflect on values over time |
| | Difficulty remembering | Reflect on values over time |
| | Fatigue or low energy | |
| | Confusion | |
| | Drowsiness | |
| | More emotional | |
| | Irritability | |
| | Sadness | |
| | Nervous or anxious | |
| Trouble falling asleep | | |
| Symptoms get worse with physical activity? | | |
| Symptoms get worse with mental activity? | | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | Can tester interpret/LD association |
| | Today’s date | Can tester interpret/LD association |
| | Weekday | Can tester interpret/LD association |
| | Current year | Can tester interpret/LD association |
| | Current time (within 1 hour) | Can tester interpret/LD association |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | Can tester interpret/LD association |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | Can tester interpret/LD association |
| | Repeat a string of numbers in reverse order | Can tester interpret/LD association |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | Can tester interpret/LD association |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | Increased risk |
| | Full range of pain-free PASSIVE cervical spine movement | Comparative to baseline |

| | | |
|---|---|---|
| | (fixed head) Look side-to-side and up-and-down | |
| | Perform finger nose coordination test normally | Hand function may be affected |
| | Perform tandem gait normally | Leg function will be affected |
| BALANCE EXAMINATION | Double leg stance | |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | |
| | Tandem stance (non-dominant foot at back) | |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | Consider association with learning disability |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in Cerebral Palsy athletes with mixed cerebral palsy

| | | |
|---|--|---|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | |
| | Headache disorder or migraines? | |
| | Learning disability / dyslexia? | Increased risk |
| | ADD / ADHD? | Increased risk |
| | Depression, anxiety or other psychiatric disorder? | |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | Consider if accompanying person required/modify descriptive words |
| | Headache | |
| | “Pressure in head” | |
| | Neck pain | Consider baseline |
| | Nausea or vomiting | |
| | Dizziness | |
| | Blurred vision | Increased risk |
| | Balance problems | |
| | Sensitivity to light | |
| | Sensitivity to noise | |
| | Feeling slowed down | |
| | Feeling like “in a fog” | |
| | “Don’t feel right” | |
| | Difficulty concentrating | Reflect on values over time |
| | Difficulty remembering | Reflect on values over time |
| | Fatigue or low energy | |
| | Confusion | |
| | Drowsiness | |
| | More emotional | |
| | Irritability | |
| | Sadness | |
| | Nervous or anxious | |
| | Trouble falling asleep | |
| Symptoms get worse with physical activity? | | |
| Symptoms get worse with mental activity? | | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | Can tester interpret/LD association |
| | Today’s date | Can tester interpret/LD association |
| | Weekday | Can tester interpret/LD association |
| | Current year | Can tester interpret/LD association |
| | Current time (within 1 hour) | Can tester interpret/LD association |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | Can tester interpret/LD association |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | Can tester interpret/LD association |
| | Repeat a string of numbers in reverse order | Can tester interpret/LD association |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | Can tester interpret/LD association |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | Increased risk |
| | Full range of pain-free PASSIVE cervical spine movement | Comparative to baseline |

| | | |
|---|---|---|
| | (fixed head) Look side-to-side and up-and-down | |
| | Perform finger nose coordination test normally | Hand function may be affected |
| | Perform tandem gait normally | Leg function will be affected |
| BALANCE EXAMINATION | Double leg stance | |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | |
| | Tandem stance (non-dominant foot at back) | |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | Consider association with learning disability |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in athletes with intellectual impairment

| | | |
|---|--|---|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | |
| | Headache disorder or migraines? | |
| | Learning disability / dyslexia? | |
| | ADD / ADHD? | |
| | Depression, anxiety or other psychiatric disorder? | |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | Consider if accompanying person required/modify descriptive words |
| | Headache | |
| | “Pressure in head” | |
| | Neck pain | |
| | Nausea or vomiting | |
| | Dizziness | |
| | Blurred vision | |
| | Balance problems | |
| | Sensitivity to light | |
| | Sensitivity to noise | |
| | Feeling slowed down | |
| | Feeling like “in a fog” | |
| | “Don’t feel right” | |
| | Difficulty concentrating | |
| | Difficulty remembering | |
| | Fatigue or low energy | |
| | Confusion | |
| | Drowsiness | |
| | More emotional | |
| | Irritability | |
| | Sadness | |
| | Nervous or anxious | |
| | Trouble falling asleep | |
| | Symptoms get worse with physical activity? | |
| | Symptoms get worse with mental activity? | |
| | If 100% is feeling perfectly normal, what percent of normal do you feel? | |
| | STEP 3 COGNITIVE SCREENING | |
| ORIENTATION | Month | |
| | Today’s date | |
| | Weekday | |
| | Current year | |
| | Current time (within 1 hour) | |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | Can tester interpret/LD association |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | |
| | Repeat a string of numbers in reverse order | |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | |
| | Full range of pain-free PASSIVE cervical spine movement | |

| | | |
|---|---|--------|
| | (fixed head) Look side-to-side and up-and-down | Green |
| | Perform finger nose coordination test normally | Green |
| | Perform tandem gait normally | Green |
| BALANCE EXAMINATION | Double leg stance | Green |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | Green |
| | Tandem stance (non-dominant foot at back) | Green |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | Yellow |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in athletes with achondroplasia

| | | |
|---|--|---|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | |
| | Headache disorder or migraines? | |
| | Learning disability / dyslexia? | |
| | ADD / ADHD? | |
| | Depression, anxiety or other psychiatric disorder? | |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | |
| | Headache | |
| | “Pressure in head” | |
| | Neck pain | Increased incidence of atlantoaxial instability |
| | Nausea or vomiting | |
| | Dizziness | |
| | Blurred vision | |
| | Balance problems | |
| | Sensitivity to light | |
| | Sensitivity to noise | |
| | Feeling slowed down | |
| | Feeling like “in a fog” | |
| | “Don’t feel right” | |
| | Difficulty concentrating | |
| | Difficulty remembering | |
| | Fatigue or low energy | |
| | Confusion | |
| | Drowsiness | |
| | More emotional | |
| | Irritability | |
| | Sadness | |
| | Nervous or anxious | |
| | Trouble falling asleep | |
| | Symptoms get worse with physical activity? | |
| | Symptoms get worse with mental activity? | |
| | If 100% is feeling perfectly normal, what percent of normal do you feel? | |
| | STEP 3 COGNITIVE SCREENING | |
| ORIENTATION | Month | |
| | Today’s date | |
| | Weekday | |
| | Current year | |
| | Current time (within 1 hour) | |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | |
| | Repeat a string of numbers in reverse order | |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | |
| | Full range of pain-free PASSIVE cervical spine movement | Increased incidence of atlantoaxial instability |

| | | |
|---|---|--|
| | (fixed head) Look side-to-side and up-and-down | |
| | Perform finger nose coordination test normally | |
| | Perform tandem gait normally | |
| BALANCE EXAMINATION | Double leg stance | |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | |
| | Tandem stance (non-dominant foot at back) | |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in athletes with arthrogyrosis

| | | |
|---|--|---|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | |
| | Headache disorder or migraines? | |
| | Learning disability / dyslexia? | |
| | ADD / ADHD? | |
| | Depression, anxiety or other psychiatric disorder? | |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | |
| | Headache | |
| | “Pressure in head” | |
| | Neck pain | |
| | Nausea or vomiting | |
| | Dizziness | |
| | Blurred vision | |
| | Balance problems | Weakness/balance may be difficult to assess given reduced joint ROM |
| | Sensitivity to light | |
| | Sensitivity to noise | |
| | Feeling slowed down | |
| | Feeling like “in a fog” | |
| | “Don’t feel right” | |
| | Difficulty concentrating | |
| | Difficulty remembering | |
| | Fatigue or low energy | |
| | Confusion | |
| | Drowsiness | |
| | More emotional | |
| | Irritability | |
| | Sadness | |
| | Nervous or anxious | |
| | Trouble falling asleep | |
| Symptoms get worse with physical activity? | | |
| Symptoms get worse with mental activity? | | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | |
| | Today’s date | |
| | Weekday | |
| | Current year | |
| | Current time (within 1 hour) | |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | |
| | Repeat a string of numbers | |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | |
| | Repeat a string of numbers in reverse order | |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | |
| | Full range of pain-free PASSIVE cervical spine movement | May be altered due to reduced joint ROM |

| | | |
|---|---|---|
| | (fixed head) Look side-to-side and up-and-down | |
| | Perform finger nose coordination test normally | May be altered due to reduced joint ROM |
| | Perform tandem gait normally | May be altered due to reduced joint ROM |
| BALANCE EXAMINATION | Double leg stance | Gait affected in those with LE manifestations |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | Gait affected in those with LE manifestations |
| | Tandem stance (non-dominant foot at back) | Gait affected in those with LE manifestations |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in athletes with polio

| | | |
|---|--|--|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | |
| | Headache disorder or migraines? | |
| | Learning disability / dyslexia? | |
| | ADD / ADHD? | |
| | Depression, anxiety or other psychiatric disorder? | |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | |
| | Headache | |
| | “Pressure in head” | |
| | Neck pain | Dependent on which muscles affected |
| | Nausea or vomiting | |
| | Dizziness | |
| | Blurred vision | |
| | Balance problems | Dependent on which muscles affected |
| | Sensitivity to light | |
| | Sensitivity to noise | |
| | Feeling slowed down | Consider presence in post polio syndrome |
| | Feeling like “in a fog” | Consider presence in post polio syndrome |
| | “Don’t feel right” | Consider presence in post polio syndrome |
| | Difficulty concentrating | Consider presence in post polio syndrome |
| | Difficulty remembering | Consider presence in post polio syndrome |
| | Fatigue or low energy | Consider presence in post polio syndrome |
| | Confusion | |
| | Drowsiness | Consider presence in post polio syndrome |
| | More emotional | |
| | Irritability | |
| | Sadness | |
| | Nervous or anxious | |
| | Trouble falling asleep | |
| Symptoms get worse with physical activity? | Consider presence in post polio syndrome | |
| Symptoms get worse with mental activity? | Consider presence in post polio syndrome | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | |
| | Today’s date | |
| | Weekday | |
| | Current year | |
| | Current time (within 1 hour) | |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | |
| | Repeat a string of numbers in reverse order | |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | |
| | Full range of pain-free PASSIVE cervical spine movement (fixed head) Look side-to-side and up-and-down | Dependent on which muscles affected |
| | | |

| | | |
|---|---|---|
| | Perform finger nose coordination test normally | Likely to have baseline weakness (less likely tingling/burning) |
| | Perform tandem gait normally | Likely to have baseline weakness (less likely tingling/burning) |
| BALANCE EXAMINATION | Double leg stance | Dependent on which muscles affected |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | Dependent on which muscles affected |
| | Tandem stance (non-dominant foot at back) | Dependent on which muscles affected |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in athletes with muscular dystrophy

| | | |
|---|--|---------------------------------------|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | |
| | Headache disorder or migraines? | |
| | Learning disability / dyslexia? | |
| | ADD / ADHD? | |
| | Depression, anxiety or other psychiatric disorder? | |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | |
| | Headache | |
| | “Pressure in head” | |
| | Neck pain | |
| | Nausea or vomiting | |
| | Dizziness | Vision can be affected in OPMD |
| | Blurred vision | Vision can be affected in OPMD |
| | Balance problems | |
| | Sensitivity to light | |
| | Sensitivity to noise | |
| | Feeling slowed down | |
| | Feeling like “in a fog” | |
| | “Don’t feel right” | |
| | Difficulty concentrating | |
| | Difficulty remembering | |
| | Fatigue or low energy | Increased risk common |
| | Confusion | |
| | Drowsiness | |
| | More emotional | |
| | Irritability | |
| | Sadness | |
| | Nervous or anxious | |
| Trouble falling asleep | | |
| Symptoms get worse with physical activity? | Early fatigue is common in people with MD | |
| Symptoms get worse with mental activity? | | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | |
| | Today’s date | |
| | Weekday | |
| | Current year | |
| | Current time (within 1 hour) | |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | |
| | Repeat a string of numbers | |
| CONCENTRATION – Digits backwards | Repeat a string of numbers in reverse order | |
| | Tell the months of the year in reverse order | |
| MONTHS IN REVERSE ORDER | | |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | |
| | Full range of pain-free PASSIVE cervical spine movement | May be altered due to muscle weakness |
| | (fixed head) Look side-to-side and up-and-down | Vision can be affected in OPMD |

| | | |
|---|---|---------------------------------------|
| | Perform finger nose coordination test normally | May be altered due to muscle weakness |
| | Perform tandem gait normally | May be altered due to muscle weakness |
| BALANCE EXAMINATION | Double leg stance | May be altered due to muscle weakness |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | May be altered due to muscle weakness |
| | Tandem stance (non-dominant foot at back) | May be altered due to muscle weakness |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in athletes with multiple sclerosis

| | | |
|---|--|---|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | |
| | Headache disorder or migraines? | |
| | Learning disability / dyslexia? | |
| | ADD / ADHD? | |
| | Depression, anxiety or other psychiatric disorder? | |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | |
| | Headache | Headaches can be seen in MS especially if high burden brain lesions |
| | “Pressure in head” | Headaches can be seen in MS especially if high burden brain lesions |
| | Neck pain | |
| | Nausea or vomiting | |
| | Dizziness | Vision can be affected in MS |
| | Blurred vision | Vision can be affected in MS |
| | Balance problems | |
| | Sensitivity to light | |
| | Sensitivity to noise | |
| | Feeling slowed down | |
| | Feeling like “in a fog” | |
| | “Don’t feel right” | |
| | Difficulty concentrating | |
| | Difficulty remembering | |
| | Fatigue or low energy | |
| | Confusion | |
| | Drowsiness | |
| | More emotional | |
| | Irritability | |
| | Sadness | |
| | Nervous or anxious | |
| Trouble falling asleep | | |
| Symptoms get worse with physical activity? | | |
| Symptoms get worse with mental activity? | | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | |
| | Today’s date | |
| | Weekday | |
| | Current year | |
| | Current time (within 1 hour) | |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | |
| CONCENTRATION – Digits backwards | Repeat a string of numbers | |
| | Repeat a string of numbers in reverse order | |
| MONTHS IN REVERSE ORDER | Tell the months of the year in reverse order | |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | |
| | Full range of pain-free PASSIVE cervical spine movement | May be altered due to muscle weakness |

| | | |
|---|---|---------------------------------------|
| | (fixed head) Look side-to-side and up-and-down | |
| | Perform finger nose coordination test normally | May be altered due to muscle weakness |
| | Perform tandem gait normally | May be altered due to muscle weakness |
| BALANCE EXAMINATION | Double leg stance | Peripheral strength affected in MS |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | Peripheral strength affected in MS |
| | Tandem stance (non-dominant foot at back) | Peripheral strength affected in MS |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes

Considerations and usability of the 5th edition of the Sport Concussion Assessment Tool (SCAT5) for the office or off-field assessment in athletes with spina bifida

| | | |
|---|--|---|
| STEP 1 ATHLETE BACKGROUND | Hospitalization for a head injury? | |
| | Headache disorder or migraines? | |
| | Learning disability / dyslexia? | |
| | ADD / ADHD? | |
| | Depression, anxiety or other psychiatric disorder? | |
| STEP 2 SYMPTOM EVALUATION The athlete should be given the symptom form and asked to read this instruction paragraph out loud, and then complete the symptom scale | Symptom form with instructions | |
| | Headache | Headaches can be seen in SB especially if chronic hydrocephalus |
| | “Pressure in head” | Headaches can be seen in SB especially if chronic hydrocephalus |
| | Neck pain | Also a symptom of hydrocephalus |
| | Nausea or vomiting | Also a symptom of hydrocephalus |
| | Dizziness | |
| | Blurred vision | |
| | Balance problems | |
| | Sensitivity to light | |
| | Sensitivity to noise | |
| | Feeling slowed down | |
| | Feeling like “in a fog” | |
| | “Don’t feel right” | |
| | Difficulty concentrating | Also a symptom of hydrocephalus |
| | Difficulty remembering | Also a symptom of hydrocephalus |
| | Fatigue or low energy | |
| | Confusion | |
| | Drowsiness | |
| | More emotional | |
| | Irritability | |
| | Sadness | |
| Nervous or anxious | | |
| Trouble falling asleep | | |
| Symptoms get worse with physical activity? | | |
| Symptoms get worse with mental activity? | | |
| If 100% is feeling perfectly normal, what percent of normal do you feel? | | |
| STEP 3 COGNITIVE SCREENING | | |
| ORIENTATION | Month | |
| | Today’s date | |
| | Weekday | |
| | Current year | |
| | Current time (within 1 hour) | |
| IMMEDIATE MEMORY | Repeat as many words as possible from a read list | Mild intellectual impairment often present in SB |
| | Repeat a string of numbers | Mild intellectual impairment often present in SB |
| CONCENTRATION – Digits backwards | Repeat a string of numbers in reverse order | Mild intellectual impairment often present in SB |
| | Tell the months of the year in reverse order | |
| MONTHS IN REVERSE ORDER | | |
| STEP 4 NEUROLOGICAL SCREEN | Read out loud and follow instructions without difficulty | Mild intellectual impairment often present in SB |
| | Full range of pain-free PASSIVE cervical spine movement | |

| | | |
|---|---|--|
| | (fixed head) Look side-to-side and up-and-down | |
| | Perform finger nose coordination test normally | |
| | Perform tandem gait normally | LE strength affected in SB; UE motor testing likely normal |
| BALANCE EXAMINATION | Double leg stance | LE strength affected in SB; UE motor testing likely normal |
| Modified Balance Error Scoring System (mBESS) testing | Single leg stance (non-dominant foot) | LE strength affected in SB; UE motor testing likely normal |
| | Tandem stance (non-dominant foot at back) | LE strength affected in SB; UE motor testing likely normal |
| STEP 5 DELAYED RECALL | Repeat as many words as possible from the previously read list (step 3) | Mild intellectual impairment often present in SB |

Green shading: no anticipated additional considerations for Para athletes; Yellow shading: potential additional considerations for some Para athletes (dependent on the level or nature of athlete impairment); Red shading: items from the SCAT5 that should not be used for Para athletes