




# Introducing the Child Sport Concussion Assessment Tool 6 (Child SCAT6)

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## BACKGROUND AND RATIONALE

The requirement for a child-specific tool that can be used by health care professionals (HCPs) in the management of sport-related concussion (SRC) was recognised by the Concussion in Sport Group (CISG) in 2012 with the introduction of the Child Sport Concussion Assessment Tool 3 (Child SCAT3) for use with children ages 5–12 years.<sup>1</sup> This tool paralleled and complemented the SCAT3, which was developed for use in athletes, ages 13 years and over.<sup>1</sup> The CISG revised the Child SCAT3 following the fifth International Consensus Conference on Concussion in Sport (Berlin 2016), with the release of the Child SCAT5.<sup>2</sup> At that time, the version number (5) was chosen to align the version number with the consensus meeting number, and therefore, there is no Child SCAT4.

During 6th International Conference on Concussion in Sport held in Amsterdam in 2022, the CISG reviewed the evidence to implement improvements to the Child SCAT5 and develop the Child SCAT6.

## PROCESS FOR DEVELOPMENT

The 6th International Conference on Concussion in Sport followed a consensus development process, incorporating multiple systematic reviews, an open forum meeting with additional poster abstracts, and expert panel deliberations following the meeting.<sup>3</sup> A systematic review of the acute detection of SRC was performed to evaluate the literature examining the identification

and assessment of SRC in the acute phase of injury and provide recommendations for improving the SCAT and Child SCAT tools.<sup>4</sup> The systematic review indicated that the SCAT tools were most appropriate for the acute assessment of concussion, up to 7 days post-injury, and optimally within 72 hours of injury. In the subacute period (beyond 72 hours), the new Sport Concussion Office Assessment Tool 6 (SCOAT6) and Child SCOAT6 tools should be used.<sup>5–7</sup> Subsequent to the open meeting and expert panel consensus meeting, a subgroup of the Amsterdam panel met on a separate day dedicated to developing revised versions of the tools, including the Child SCAT6.

The systematic reviews, open conference and panel discussions addressed the required modifications for the SCAT6 and Child SCAT6. The panel deliberations resulted in a revised SCAT6,<sup>8</sup> and incorporating these results, reached consensus on application of these modifications to the Child SCAT6. The first issue addressed was age appropriateness, and careful evaluation of the data determined that the Child SCAT6 was most appropriate for children ages 8–12 years, with limited evidence supporting its utility in children ages 5–7 years. It was further determined that use of the SCAT6 in adolescents (ages 13–18 years) would be appropriate. A separate tool, the Concussion Recognition Tool 6, has been developed for use by non-medically trained individuals for the identification and immediate management of suspected concussion.<sup>9</sup>

## CONTENT OF THE CHILD SCAT6 Modifications for the Child SCAT6

- ▶ The Child SCAT6 is for use in children ages 8–12 years.
- ▶ The Child SCAT6 is intended for use in the acute phase (72 hours) post-injury, but can be used up to 7 days postinjury.
- ▶ Red Flags — added Glasgow Coma Score (GCS) < 15 and visible deformity of the skull.
- ▶ Preferred language added to demographics section.
- ▶ ‘Office assessment’ removed.
- ▶ Moved the Neurological Screen to the Immediate Assessment (including Observable Signs, GCS, Cervical Spine and Ocular/Motor Assessment), and added components to other sections.
  - Observable signs — added impact seizure, falling unprotected to the surface and high-risk mechanism of injury.
  - Cervical spine assessment — added tenderness to palpation.
  - Added coordination and oculomotor screen to follow cervical spine assessment.
  - Modified finger-to-nose to perform eyes open, then eyes closed.
- ▶ Athlete background — modified terminology ‘diagnosis of psychiatric disorder’ to ‘psychological disorder’
- ▶ Symptom evaluation—moved neck symptoms to the end of list to maintain original Health and Behaviour Inventory<sup>10</sup> item order.
- ▶ Moved total symptom scores to follow completion of athlete answers to worsening of symptoms and overall assessment
- ▶ Immediate memory — removal of 5-word lists; instead recommend 10-word list for all children.
- ▶ Days in reverse order — time to complete is recorded, and correct response accepted only if completed within 30 s.
- ▶ Balance — Modified Balance Error Scoring System (mBESS) — all three stances (double leg, single leg, tandem stance) to be assessed; option to include assessment on foam surface; proceed to tandem gait/complex tandem gait and dual-task tandem gait if no significant difficulties with mBESS.
- ▶ Tandem gait — child performs three timed trials, and fastest trial is recorded.
- ▶ Addition of complex tandem gait — forward and backwards, each with eyes open and eyes closed.<sup>11</sup>

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- ▶ Dual-Task tandem gait — added as an optional task; assesses tandem gait while simultaneously performing a cognitive task (eg, count backwards by 3's), and assess errors and time to completion.
- ▶ Return-to-learn recommendations modified, consistent with the recommendations from the systematic review.<sup>12</sup>
- ▶ Return-to-sport recommendations modified, with inclusion of two stages of aerobic exercise, consistent with the findings of the systematic reviews on Rest and Exercise,<sup>13</sup> Rehabilitation<sup>14</sup> and Return to Sport.<sup>12</sup>

## HOW TO USE THE CHILD SCAT6

The Child SCAT6 provides the HCP with a tool to use in the acute period following SRC. The emphasis on the initial 72 hours postinjury provides clarity in the operational application of the Child SCAT6, with subacute assessment addressed with the Child SCAT6.

A consistent finding from the systematic reviews and panel discussions during the Amsterdam meeting was the limited data available on SRC in children 5–7 years of age. Developmentally, these younger children are quite different from 8 to 12 years old children, and thus, the validated components of the Child SCAT6 were determined to be most appropriate for children ages 8–12 years. While the CISC did not develop a separate tool for children ages 5–7 years, we acknowledge that some HCPs experienced in the management of paediatric SRC may continue to use some elements of the Child SCAT6 in children aged 5–7 years, making modifications to the assessment as required; however, no validated or normative data are available to support use in this age group, and caution is required when used with younger children.

The Child SCAT6 is for use in all children ages 8–12 years; however, many components of the tool have not been validated in children with disabilities, or across diverse cultural and language groups. During the Amsterdam meeting, the requirements of the para athlete were emphasised, and the paucity of data on the paediatric para athlete suggests that significant work is required to develop age-appropriate tools for the para athlete in the school, community and elite settings.

The Child SCAT6 is available for free, unrestricted distribution for use in childhood SRC, provided that no modifications are made to the tool. The development of the tool is evidence informed, and we

encourage its widespread distribution and use by HCPs worldwide.

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