

THE DEVELOPMENT OF A RETURN TO LEARN PROTOCOL FOR THE ANCHORAGE  
SCHOOL DISTRICT

By

Candice Faria

RECOMMENDED:

---

Lisa Jackson, DNP, FNP, NP-C

---

Elizabeth Driscoll, PhD, FNP, RN  
Chair, Advisory Committee

---

Barbara Berner, EdD, APRN, FNP-BC, FAANP  
Director, School of Nursing

APPROVED:

---

Susan Kaplan, PhD, MBA, OT  
Senior Associate Dean, College of Health

---

Date

Running head: RETURN TO LEARN PROTOCOL

THE DEVELOPMENT OF A RETURN TO LEARN PROTOCOL FOR THE ANCHORAGE  
SCHOOL DISTRICT

A  
PROJECT

Presented to the Faculty  
of the University of Alaska Anchorage

in Partial Fulfillment of the Requirements  
for the Degree of

MASTER OF SCIENCE

By

Candice R. Faria, BS

Anchorage, Alaska

August 2015

### Abstract

Each year in the pediatric population, there are over five hundred thousand emergency room visits for concussion (Meckler, 2014). Children and adolescents who suffer from concussion require longer recovery periods and may experience greater cognitive dysfunction than adults (Marsh, Fraser, & Marsh, 2013). The proper management of the cognitive effects of pediatric concussion is essential, given the large amount of time children and adolescents spend in the academic setting. The purpose of this academic project was to critically appraise the current literature for the highest level of evidence related to the management of the cognitive symptoms of pediatric concussion. The information gained from this critical appraisal of the literature was utilized to develop an evidence-based return to learn protocol for the Anchorage School District; focused on management of the cognitive symptoms of pediatric concussion in the academic setting.

## **Background and Literature Review**

### **Concussion Defined**

Concussion is defined as “a direct or indirect force to the head that results in immediate, short-lived neurological impairment that resolves spontaneously, typically followed by physical, cognitive, emotional symptoms and sleep disturbance” (Sady, Vaughan, & Gioia, 2011, pg. 2). This definition of concussion is applicable to all age groups; however, there are significant differences in the pathophysiology, severity of symptoms, and recovery periods between adults and children. The different effects of concussion in the pediatric population versus the adult population require different recovery management strategies.

### **Concussion Statistics**

Concussions in the pediatric population are a common occurrence, with a significant number occurring during organized sports. Concussive injury is six times more likely to occur in organized sports than any other activity between the ages of six and sixteen (Lovell & Fazio, 2008). There are more than five hundred thousand annual emergency room visits for pediatric concussion, with an estimated twenty-five percent occurring during sports-related activities (Meckler, 2014). From 1997 to 2007, emergency room visits for concussion doubled in children ages eight to thirteen, and increased by more than two hundred percent for ages fourteen through nineteen (Moser, Glatts, & Schatz, 2012). An estimated three hundred thousand head injuries occur annually in high school athletics alone; with ninety percent of these injuries diagnosed as concussion (Karlin, 2011). Concussion represents an estimated nine percent of all high school athletic injuries; fifty-three percent of high school students report a history of concussion (Karlin, 2011; Lovell & Fazio, 2008). The actual incidence of concussion in the pediatric population is likely underestimated and underreported due to a multitude of factors, such as lack of initial

recognition and failure to report; the latter due to a fear of loss of playing time, or other repercussions (Karlin, 2011). Educating coaches, athletic trainers, and parents to recognize the signs and symptoms of concussion should increase reporting of concussions sustained during organized sports, and lead to the initiation of return to play and return to learn protocols.

Competitive sports are not the only activities in which children and adolescents can sustain a concussion. Children who participate in physical education classes and other recreational activities outside of competitive sports are also at risk (McLeod, 2014). Pediatric concussions that occur outside of competitive sports should be managed using the same guidelines as concussions incurred during athletic competition.

### **Pediatric Susceptibility to Concussion**

Compared to adults, the pediatric patient is more susceptible to concussion, requires longer recovery time, and may experience more significant cognitive effects from concussion (Marsh et al., 2013; Parcell, 2009; Sady et al., 2011). There has been minimal research regarding the effects of multiple concussions on the developing brain; therefore the effects of multiple concussions later in life are unknown (Karlin, 2011). There is evidence, that the younger children are when they experience their first concussion, the greater their chance of sustaining additional concussive injuries in their formative years (Davis & Purcell, 2014). Children who have sustained a concussion have a three to six times higher risk of sustaining another concussion (Giza, 2014). Due to the pediatric population's increased susceptibility to sustain a concussion, and the lack of research on the cumulative effects of multiple concussions sustained in the formative years, pediatric concussion must be properly managed to minimize short-term symptoms and long-term sequelae.

**Pathophysiology of Concussion**

The brain's pathophysiological response to concussion includes axonal depolarization and ionic changes, resulting in altered cerebral blood flow and glucose metabolism (Moser & Schatz, 2012). Adults who suffer a concussion typically experience structural or metabolic concussion, whereas children are more likely to experience a physiologic interruption or reduction in cerebral blood flow. This may last for up to one month and may be a major contributor to the symptoms of pediatric concussion (Maugans, Farley, Altaye, Leach, & Cecil, 2012). Due to the differences in the pathophysiology of concussion between adults and children, different management strategies must be implemented.

Experimental evidence suggests that a concussed brain is less responsive to usual neural activation. Thus the brain might be vulnerable to prolonged dysfunction if premature cognitive activity occurs before full recovery from a concussion (Harmon et al., 2013). Some research hypothesized that engaging in cognitive activity post-concussion may stress the brain and result in worsening symptoms and prolonged recovery time (Sady et al., 2011). Rest from cognitive activity post-concussion is necessary to allow the brain time to heal. Providing for this cognitive rest is an essential part of the management of pediatric concussion, especially with regards to students and their return to the academic environment.

**Signs and Symptoms of Concussion**

There are numerous signs and symptoms of concussion in the pediatric population. These signs and symptoms are divided into four main symptom categories: physical, cognitive, emotional, and sleep. A concussed child may experience a combination of these signs and symptoms, as well as differing severities of symptoms (Meckler, 2014). Physical symptoms include: headache, nausea, vomiting, dizziness, lightheadedness, visual symptoms (e.g. light

sensitivity, double or blurry vision), noise sensitivity, and fatigue. Cognitive symptoms of pediatric concussion include difficulties with concentration and memory, confusion, and loss of consciousness. Emotional symptoms include irritability, depression, nervousness, and personality changes. Sleep disturbances include drowsiness, sleeping more or less than usual, and difficulty falling asleep (Halstead, 2013; Meckler, 2014; Sady et al., 2011). Children and adolescents who have experienced a concussion will differ widely in their presentation and severity of symptoms. Symptoms often occur on a continuum; physical and cognitive activities can vary in their exacerbation of symptoms.

Headaches are the most common symptom reported in all pediatric concussions (Halstead et al., 2013). Pediatric patients who present to the emergency department are more likely to experience headache immediately after the initial concussion injury (Eisenberg, Meehan III, & Mannix, 2014). Loss of consciousness is not necessary for a diagnosis of concussion in any age group; this misconception presents a major obstacle in the proper identification, diagnosis, and management of pediatric concussion (Rains & Robinson, 2010).

### **Impact of Concussion**

Improper diagnosis and management of concussion in children and adolescents can result in second impact syndrome, post-concussion syndrome, long-term cumulative sequelae, and potential coma or death (Purcell, 2009). Post-concussion syndrome (PCS) is common sequelae of concussion, involving a symptom complex consisting of headache, dizziness, neuropsychiatric symptoms, and cognitive impairment (Evans, 2014). Thirty to eighty percent of children and adolescents with mild to moderate brain injuries will experience symptoms of PCS (West & Marion, 2014). Second impact syndrome is more common in high school athletes; and may result in death, if a second blow to the head occurs prior to complete recovery from concussion

(Moser & Schatz, 2012). Second impact syndrome can be described as “malignant cerebral edema and neurological collapse after sustaining two or more concussive blows with incomplete recovery between them” (Giza, 2014, p. 1577). Prompt diagnosis of pediatric concussion, along with proper management of the physical and cognitive symptoms of concussion, including implementing return to play and return to learn protocols, could reduce the incidence of second impact syndrome, post-concussion syndrome, long-term cumulative sequelae, and potential coma or death.

### **Pediatric Recovery from Concussion**

Research regarding recovery from concussion in the pediatric population is limited, especially regarding children younger than fourteen. The research shows that there are no adverse long-term outcomes related to pediatric concussion, if diagnosed quickly and managed appropriately (Baker et al., 2014). In most cases, the symptoms of pediatric concussion last between seven and ten days; however, ten to fifteen percent of children report symptoms lasting longer (Meckler, 2014). Concussion symptoms will resolve within three weeks in eighty percent of athletes between the ages of ten and eighteen (Moser et al., 2012). There is not enough research on recovery duration in children younger than fourteen; younger children may require longer recovery periods (Meckler, 2014). While most children and adolescents experience full symptom resolution within three weeks, recovery times from concussion vary, and may range from days to weeks to months (Sady et al., 2011). School districts should have protocols in place to assist with concussion recovery for as long as students require.

Recovery from concussion is largely a function of symptom severity and time. Symptom severity is determined by the number of symptoms that children experience and their sensitivity to cognitive and physical exertion. Recovery from concussion is separated into early post-injury



(e.g. the first few days) and the subsequent weeks. The endpoint of concussion recovery is multifaceted, involving the following criteria: return of neurocognitive and balance function to pre-injury levels, absence of symptoms to pre-injury levels while at rest, and absence of symptoms when the child participates in physical or cognitive activities (Sady et al., 2011). It is important for the management of pediatric concussion to ensure that all of these criteria are met prior to returning the student to full physical and cognitive exertion.

Differences in reported vulnerability to, and recovery from, concussion between the pediatric and adult populations are hypothesized to be caused by immaturity of the developing central nervous system, larger head-to-body ratio, continuing development of the frontal cortex, thinner cranial bones, differences in cerebral blood volume, a larger subarachnoid space, hormonal influences, and reduced development of the neck and shoulder musculature (Howell, Osternig, Van Donkelaar, Mayr, & Chou, 2013; Karlin, 2011; Sady et al., 2011). There are also numerous conditions that may influence recovery from concussion, including: age, gender, mechanism of action of injury, and comorbid conditions such as Attention Deficit/Hyperactivity Disorder, anxiety, depression, and headache (Sady et al., 2011). Medications such as psychoactive drugs, anticoagulants, and sedative drugs may also influence recovery time from pediatric concussion (Meckler, 2014). Recovery from pediatric concussion may be complicated by other factors: the number of previous concussions, duration of symptoms of prior concussions, severity of prior concussions, and loss of consciousness for upwards of one minute during a previous concussion (Meckler, 2014). These factors must be taken into account when managing pediatric concussion; each individual's management plan must be tailored to their history and presentation.

### **Neurocognitive Deficits Caused by Concussion in the Adolescent**

The current research into neurocognitive deficits caused by concussion focuses primarily on adolescent populations. The measurable effects of concussion on cognitive function include: decreased processing speed and reaction time, decreased attention span, lessened ability to learn and retain new information and to complete tests or homework on time (Karlin, 2011; Sady, et al., 2011). Piebes, Gourley, and McLeod (2009) found that memory and information processing speed take the longest to return to baseline. Post-concussion executive function may be disrupted for upwards of two months in adolescents (Howell et al., 2013). Neurocognitive deficits from concussion may last longer than reported by pediatric patients, and may persist after the physical symptoms of the concussion have resolved (Howell et al., 2013; Purcell, 2009). Twenty-six percent of athletes diagnosed with concussion who self-reported being asymptomatic and ready to return to play experienced persistent neurocognitive deficits (Karlin, 2011). The possibility for persistent neurocognitive deficits after concussion highlights why neurocognitive testing is vital during recovery from concussion.

Post concussion, high school athletes have prolonged memory dysfunction when compared to college-aged athletes and performed significantly “worse than age-matched controls at seven days after injury, whereas college athletes showed recovery by day three after injury” (Purcell, 2009, p. 52). High school athletes with mild concussion had significantly lower memory scores seven days post injury, despite reporting resolution of post-concussion symptoms at day four (Purcell, 2009). Average time for normalization to pre-concussion neurocognitive testing baselines in high school students is ten to fourteen days, compared with five to seven days for collegiate athletes (Karlin, 2011). Verbal memory deficits lasting for up to fourteen days were also noted in high school athletes post concussion (Purcell, 2009). Academically,

pediatric athletes who sustain more than one concussion demonstrated lower grade point averages than students without a history of concussion (Karlin, 2011). Based on this research, the neurocognitive deficits from concussion are significantly greater in the adolescent population than in the adult population due to the continuing development of the frontal cortex and differing anatomy. Due to the lack of research into the neurocognitive deficits in non-adolescent children caused by concussion, measurable effects of concussion on cognitive functioning are unknown.

### **Baseline Neurocognitive Testing**

Management of concussion for participants in organized sports requires neurocognitive testing prior to the onset of injury. Athletic preseason neurocognitive testing such as ImPACT (Immediate Postconcussion Assessment and Cognitive Testing) should be conducted to provide a pre-injury baseline measurement of cognitive ability (McGrath, 2010). ImPACT is a computer-based test administered by healthcare professionals that establishes baseline cognitive functioning. Current recommendations for concussion assessment suggest that baseline and post-injury tests incorporate neurocognitive, mental status, and postural stability tests, in conjunction with a symptom scale or checklist. Neurocognitive testing measures memory, processing speed, visuomotor and visuospatial abilities, execution, planning, and attention (Piebes et al., 2009). Neurocognitive tests should not be used as a stand-alone diagnostic tool. The results of baseline neurocognitive testing are used to track recovery from concussion based on the initial scores of that particular individual.

In the event of a possible concussion, the student athlete should be assessed for the presence and severity of concussion using a formalized protocol, such as the Standardized Assessment of Concussion. Once concussion has been diagnosed, the student athlete should have a neurocognitive evaluation within the first days of the injury, preferably within twenty-

four hours (McGrath, 2010). Periodic neurocognitive retesting should also occur post-injury at days three, five, and seven, or until the student reaches their baseline score (McGrath, 2010; Piebes et al., 2009). Proper management of pediatric concussion requires that postconcussion status be compared to preconcussion baselines in order to ensure full resolution of symptoms (Meckler, 2014). Neurocognitive testing plays an important role in the management of pediatric concussion, ensuring that the symptoms of concussion resolve; however, these tests have not been applied systematically to determine when a student is ready to return to school (Halstead et al., 2013). Neurocognitive testing is not currently required for the implementation of a return to learn protocol.

### **Return to Play Protocols**

Return to play protocols are used to evaluate when a person diagnosed with concussion can safely return to sports or physical education classes. The most important initial action that should be implemented when pediatric patients have sustained a concussion is their immediate removal from play. Pediatric athletes should not return to play on the same day that a concussion is sustained (Meckler, 2014). Upon resolution of acute symptoms, a graduated return to play protocol should be implemented. Pediatric athletes should be symptom free for seven to ten days before beginning any physical activity (Marsh et al., 2013). Most current return to play protocols are based on adult models; experts believe that a more graduated return to play protocol should be implemented in the pediatric population (Marsh et al., 2013). The return to play progression has five steps: (1) light aerobic exercise for five to ten minutes, (2) moderate exercise with limited head and body movement, (3) non-contact exercise, (4) practice, and (5) full return to competition (Centers for Disease Control and Prevention [CDC], 2011). Pediatric athletes

cannot experience any symptoms of concussion at their current step before proceeding to the next step in the return to play progression (CDC, 2011).

Pediatric patients diagnosed with concussion must successfully progress through a return to learn protocol prior to beginning a return to play protocol (Giza, 2014). Students should be performing at academic baseline before returning to sports, full physical activity, or other extracurricular activities (Halstead et al., 2013; McGrath, 2010). Pediatric patients must successfully complete both protocols in order to return to full participation in the academic setting and full participation in contact sports or activities.

### **Cognitive Rest**

In 2004, the Second International Conference on Concussion in Sport introduced the concept of cognitive rest to the management of sport-related concussion (Arbogast et al., 2013). The American Medical Society for Sports Medicine's position statement on concussion states that "students will require cognitive rest and may require academic accommodations such as reduced workload and extended time for tests while recovering from concussion" (Harmon et al., 2013, p. 2). Cognitive rest is defined as the avoidance of cognitive stressors such as use of a cell phone, text messaging, listening to loud music, watching television, playing video games, reading or completing schoolwork while still experiencing the symptoms of concussion (Halstead et al., 2013, Karlin, 2011; McLeod, 2010; Purcell, 2009; Sady et al., 2011). The therapeutic goal of cognitive rest is to limit cognitive activity during concussion recovery to a level that will not exacerbate symptoms, or allow them to reemerge; maintaining a subsymptom threshold of cognitive activity (Master, Gioia, Leddy, & Grady, 2012; McLeod, 2010). Cognitive rest is an important component of concussion management and should play a major role in return to learn protocols.

To date, there is minimal research documenting the benefit or harm of cognitive rest for pediatric patients diagnosed with concussion (Halstead et al., 2013). Sady et al. (2011) found that using a concussed brain to learn can worsen symptoms and prolong recovery time. A study conducted by Brown et al. (2014) found that pediatric patients who had sustained concussion and engaged in the highest levels of cognitive activity had the longest duration of concussion-related cognitive symptoms. The study conducted by Brown et al. (2014) supported the use of cognitive rest and suggested that limiting extensive cognitive activity reduces the duration of concussion symptoms. McCrory et al. (2013) recommend that, in the absence of evidence-based recommendations for the management of cognitive symptoms, a gradual return to school with activities that do not cause cognitive overexertion should be implemented. Since the introduction of cognitive rest, numerous professional entities and researchers have supported its use in the management of the cognitive effects of pediatric concussion.

### **Concussion Management**

The current medical consensus on concussion management is physical and cognitive rest until acute symptoms resolve (McCrory et al., 2013). The literature includes the topic of symptom threshold in the management of the cognitive effects of pediatric concussion. Symptom threshold refers to the level of cognitive exertion that a pediatric concussion patient can sustain without exhibiting symptoms. Symptom exacerbation following physical and cognitive activity after a concussion signals that the neurometabolic demands of the brain are being exceeded. This worsening of symptoms following cognitive activity is termed “cognitive exertion”. The emergence of new symptoms or the worsening of existing symptoms is indicative of cognitive overexertion and an exceeded symptom threshold (Sady et al., 2011). More than eighty percent of students six to eighteen years old with concussion experienced an increase in

symptom severity during the first two weeks of their return to the classroom (Gioia, Vaughan, & Reesman, 2010). A retrospective chart review by Sady et al. (2011) found greater neurocognitive deficits and higher symptom reports associated with higher levels of cognitive and physical activity during recovery time. A gradual return to cognitive academic demands following concussion is important because it ensures that cognitive demands are kept below the symptom threshold. If cognitive overexertion occurs, cognitive demands should be reduced to keep the student from reaching symptom threshold (Sady et al., 2011). Monitoring students for cognitive activities that cause them to exceed their symptom threshold should be an essential part of a return to learn protocol.

An important component of a return to learn protocol is a prescription for cognitive rest (Arbogast et al., 2013). A twenty-four to forty-eight hour period of cognitive rest in the acute symptomatic period after concussion has been shown to be beneficial (McCrory et al., 2013). One week of complete cognitive rest was shown to result in decreased symptoms and improved cognitive performance (Moser et al., 2012). The gradual return to cognitive academic demands (i.e. return to learn protocol) needs to be individualized and fluid as the student recovers from concussion (Sady et al., 2011). Gradual return to cognitive academic demands also reduces possible anxiety and stress to the student after returning to the academic setting (Sady et al., 2011). A written prescription for cognitive rest can provide a bridge between the student's medical provider and the school district.

### **Team Approach to Return to Learn**

Due to a lack of standardized guidelines, school policies regarding academic accommodations related to concussion vary widely (Popoli, Burns, Meehan III, & Resiner, 2014). However, schools play a quintessential role in cognitive recovery from concussion due to

the cognitive activities that children and adolescents engage in during the school day (Sady et al., 2011). Therefore, every school in a particular district should implement a consistent return to learn protocol for the management of pediatric concussion.

McAvoy (2012) divides the process of managing pediatric concussion into four steps: assessing the student's needs, developing an intervention plan, monitoring the student's progress, and adjusting the plan based on the student's symptoms. This process is repeated as necessary until the student has completely recovered from the concussion. The following teams should be part of the management process in the academic setting: the school physical activity team, the school academic team, the family team, and the medical team (Halstead et al., 2013; McAvoy, 2009). The goal of the school physical activity team is to protect against further injury to the brain (Halstead et al., 2013). The members of the school physical activity team would include physical education teachers, coaches, trainers, the athletic director, and the school nurse. The goal of the school academic team is to "coordinate the return of the student to cognitive exertion and help to facilitate the appropriate level of academic adjustments necessary to reduce or eliminate symptoms" (Halstead et al., 2013, p. 952). The members of the school academic team would include: the school nurse, teachers, counselors, school psychologist, and school administration (Halstead et al., 2013; McLeod, 2010). The goal of the family team would be to monitor the student's cognitive symptoms at home and report these to other team members. The family team may be composed of the student, parents, grandparents, or primary caregiver. The goal of the medical team would be to physically assess and monitor the signs and symptoms of concussion for the student. The medical team may be composed of the primary care physician, nurse practitioner, physician's assistant, nurse, and concussion specialists (McAvoy, 2009). The school academic team and the school physical activity team may have overlapping members



such as the school nurse or trainers. All school based teams need to work in conjunction with the student and parents to ensure successful completion of the return to play and return to learn protocols.

School nurses and athletic trainers are in a unique position to observe and document concussion symptoms (Rains & Robinson, 2010). The school nurse's responsibilities would include carrying out daily medical evaluations and providing a rest area if the student became symptomatic during the school day. The school guidance counselor's responsibilities would include monitoring the student's academic progress and coordinating academic accommodations with teachers (McGrath, 2010). School professionals should monitor for signs of cognitive overexertion: headache, fatigue, irritability, emotional lability, inappropriate behavior during class, and difficulties paying attention or learning new information (CDC, 2007). If symptoms of cognitive overexertion are noted, the return to learn protocol would be referenced to determine proper management of these symptoms.

The management of the cognitive symptoms of pediatric concussion and implementation of the return to learn protocol will involve members of all teams. One member of each team should be assigned the task of tracking symptoms of the concussion and reporting progress to the rest of the team members. This task could fall to the school nurse or the student's teachers during school hours, and the student and student's caregiver while the student is at home. Another team member, such as the school counselor or teacher, should be tasked with coordinating academic accommodations and using a symptom log to adjust the accommodations appropriately (Sady et al., 2011). The results of all of the team members' reports are utilized to assist the student's completion of the return to learn protocol.

### **Returning to School**

There are several different recommendations governing when a student diagnosed with concussion should return to the classroom. Students do not need to be asymptomatic from a concussion in order to return to school (McAvoy, 2012). Typically classes are thirty to forty-five minutes; students should be able to tolerate cognitive stimulation for thirty to forty-five minutes without symptoms before they can return to the classroom (Gioia, 2012; Halstead et al., 2013). A trial of cognitive activity, such as completing homework assignments, should be initiated prior to the student's return to school (Master et al., 2012). A student may return to school when symptoms are manageable, as long as the school is able to make proper adjustments for the student (McAvoy, 2012). The student should then be assessed on a weekly basis to determine progress towards complete cognitive healing (Halstead et al., 2013). Students are able to return to the classroom while they are symptomatic if they can tolerate thirty to forty-five minutes of cognitive exertion without symptom reemergence.

Social isolation from cognitive rest from concussion may occur if the pediatric patient is unable to attend a full day of school or their normal social or athletic activities. It is essential that students return to school once their symptoms are tolerable to prevent secondary issues, such as depression (Colorado Department of Education, 2014). Students may participate in activities in short bursts, if such activities do not worsen symptoms. Participation in their usual activities may prevent social isolation; which could result in anxiety or depression (Sady et al., 2011). Adolescents with a history of concussion have a threefold risk of depression (Giza, 2014; Master et al., 2012). Students who report anxiety and depression during recovery may need support from a guidance counselor or school psychologist. Cognitive activities are a routine part of a child's day, and therefore enforcing cognitive rest may be required by parents and other adults

such as the school nurse or counselor (Sady et al., 2011). Although the cognitive symptoms of pediatric concussion must be managed, it is important to allow social interaction during recovery to decrease the incidence of anxiety and depression.

### **Academic Accommodations**

Some symptoms of pediatric concussion can be caused or aggravated by school attendance. Visual stimuli, such as watching a video, may cause a concussed child to experience dizziness and lightheadedness. Visual concussion symptoms may lead to difficulty reading; these symptoms may be exacerbated by movies, smart boards, computers, and artificial lighting. Difficulty concentrating can cause difficulties with test taking and learning new material. Sleep disturbances caused by concussion can lead to excessive fatigue, decreased ability to concentrate, and mood changes (Halstead et al., 2013). These symptoms should be reported to a member of the concussion team for management.

There are numerous suggestions regarding the implementation of academic accommodations managing the cognitive symptoms of pediatric concussion. Strategies for incorporating cognitive rest into a concussion management plan include regular rest breaks during the day, shorter assignments, extended time for test taking, and half-day school attendance (McLeod, 2010). Other accommodations include excused absences from classes, extension of assignment deadlines, postponement or staggering of tests, being excused from specific tests and assignments, accommodation for oversensitivity to light, use of a reader for assignments or testing, use of a smaller, quieter examination room to reduce stimulation and distraction, preferential classroom seating to lessen distraction, preprinted class notes, and temporary assistance of a tutor (Karlin, 2010; McGrath, 2010; Master et al., 2012). These strategies can be implemented to prevent cognitive overexertion as the brain heals.

A return to learn protocol should include specific recommendations for certain cognitive symptoms of pediatric concussion. If students develop a headache, they should leave the classroom to rest and the headaches should be monitored by the school nurse. In order to minimize sensitivity to noise, the student should avoid eating in the lunchroom. Students who suffer from sleep deficits could nap during the day or be offered late arrival. A solution for the student suffering from anxiety due to missing class might be to rotate classes attended until the student has recovered from concussion. A student experiencing fatigue should have extended time for test taking. If the student is experiencing dizziness, the student should leave class early to walk to other classes in order avoid crowds (Sady et al., 2011). These academic accommodations as described by Sady et al. (2011) for the cognitive symptoms of pediatric concussion should be implemented as needed, until the patient no longer experiences symptoms of concussion.

### **Formal Accommodations**

Academic accommodations can be formalized if the student's symptoms last longer than two weeks. One strategy to provide concussed individuals with immediate access to recovery strategies is a letter of academic accommodation written by a medical provider (Popoli et al., 2014). There are also currently two formal policies for educational accommodations; the 504 plan, and the Individualized Education Plan (IEP). If a student has symptoms that last longer than fourteen days, an IEP or 504 Plan can be implemented. A 504 Plan is a legally binding document that requires a school to "eliminate barriers that would prevent a student from participating in the programs and services offered in the general curriculum" (Popoli et al., 2014, p. 220). The IEP is an educational provision written in the Individuals with Disabilities Act. An IEP allows for the opportunity for a multidisciplinary team to meet to develop an appropriate

educational plan of care for a student with a short term or long term disability (Karlin, 2011). An IEP and 504 Plan should be discussed with the student's school academic team upon injury if the concussion produces severe symptoms that persist for longer than fourteen days.

### **Implementation of a School-Based Concussion Management Program**

The first step in implementing a school-based concussion management program is establishing policies and procedures. Policy statements should include the following components: (1) the school's commitment to safety, (2) an explanation of the pathophysiology of a concussion, (3) a plan to assist students in their return to the classroom after a concussion, and (4) a plan to assist students in their return to physical activity after a concussion (Sady et al., 2011). A significant barrier to making appropriate return-to-learn decisions on the part of parents, teachers, and other school employees is a knowledge deficit with regards to pediatric concussion (Meckler, 2014). All appropriate school personnel and athletic staff should be trained on the contents and application of the concussion management program. The school policy should also specify how school personnel will be informed about a student's concussion and specific symptoms, as well as ways that the school personnel can assist the student's return to the classroom (Sady et al., 2011). Thirty-nine percent of the time, teachers are unaware when a student has suffered a concussion (Karlin, 2011). Establishing a communication and education protocol will increase the efficacy of the return to learn protocol.

The second step in implementing a school-based concussion management program is educating school staff about the mechanisms and effects of concussion, and the staff's role in the management of a student concussion. Education regarding concussion management should also include the long-term effects of concussion as well as the hazards of returning to activities prior to complete symptom resolution (Sady et al., 2011). Parents should also receive education once

their child has been diagnosed with a concussion about their role in the concussion management team.

The third step in implementing a school-based concussion management program is implementation of policies and procedures for students who sustain a concussion (Sady et al., 2011). These policies and procedures should be reviewed and rewritten periodically to ensure the inclusion of the highest level of evidence and most recent research. The policies and procedures should also be implemented district wide to promote continuity for students across the school district.

### **Problem Statement**

The Anchorage School District currently has a protocol for the physical management of pediatric concussion symptoms in the form of a return to play protocol. However, the Anchorage School District does not have a consistent method or protocol for managing the cognitive symptoms of pediatric concussion in the academic environment. Due to the fact that children in grades six through twelve spend a significant amount of their time in the academic setting, the development and implementation of a return to learn protocol is essential for the academic success of students diagnosed with concussion.

### **Purpose**

A meeting was arranged with Nancy Edtl, Director of Nursing and Health Services at the Anchorage School District and Derek Hagler, Director of Activities for Secondary Education at the Anchorage School District. They identified the need for the development of a cognitive rest protocol for children diagnosed with concussion within the district. This critical appraisal of the current literature was used to develop a return to learn protocol for the Anchorage School

District. This evidence-based return to learn protocol will allow the Anchorage School District to treat pediatric concussion in a systematic manner.

In order to develop this protocol, a critical appraisal of the literature was conducted to evaluate the available evidence for optimal management of the cognitive effects of pediatric concussion. In addition to optimal management, several other factors were evaluated including: (1) determine what aspects of school attendance lead to cognitive stress, (2) determine the appropriate time frame for returning to the academic environment post-concussion, and (3) determine which academic accommodations are most beneficial for reducing cognitive stress. A critical appraisal grid was developed to organize the results of the critical appraisal. The return to learn protocol was developed for use in conjunction with the Anchorage School District's existing return to play protocol.

### **Significance to Advanced Nursing Practice**

Nurse practitioners play an important role in the primary care of children and adolescents and are primary care providers for many children and adolescents in the Anchorage community. Nurse practitioners may be called upon to diagnose and manage concussions in pediatric patients. This process may involve symptom tracking and cognitive rest prescriptions, among other management strategies in cooperation with the parents, students, and school personnel. The implementation of a return to learn protocol by the Anchorage School District will result in a template for nurse practitioners to utilize when making recommendations for academic accommodations, based on the individual's symptomology.

### **Theoretical Model – Theory of Change**

Lewin's Change Theory of Nursing has three major concepts: driving forces, restraining forces, and equilibrium. Driving forces push in the direction of the change. Restraining forces

push in the opposite direction of the proposed change. Equilibrium occurs when the driving forces and the restraining forces have the same amount of influence, and therefore change does not occur (Kozier, 2008).

The driving force for this project is the recognition by the Anchorage School District of the need for a systematic approach to managing the cognitive symptoms of pediatric concussion. The district would like to implement a return to learn protocol to work in tandem with their return to play protocol. Restraining forces relating to the implementation of a return to learn protocol may include the administrative process of implementing a new protocol and encountering those who are resistant to change. If equilibrium is reached for whatever reason, then the protocol will not be implemented.

Lewin's Change Theory has three distinct stages: unfreezing, movement, and refreezing. Unfreezing involves finding a method that will allow participants to change the targeted behavior pattern. Movement is the change in behavior that is more productive. Refreezing allows participants to establish the new behavior as routine and replacing the previous behavior (Kozier, 2008).

Unfreezing will involve educating Anchorage School District personnel about the benefits of implementing the Return to Learn protocol. Movement will involve the implementation of the protocol by Anchorage School District personnel. Refreezing will involve the repeated use of the protocol and the perceived benefits of its use.

## **Methods**

### **Project Design**

In order to develop a return to learn protocol, a critical appraisal of the literature was conducted to identify best practices from the last six years. Existing literature, guidelines, and



protocols regarding return to learn and cognitive rest were reviewed for the highest levels of evidence. This information was then used in order to develop a return to learn protocol for the Anchorage School District.

### **Critical Appraisal Procedure**

A critical appraisal of the literature was completed to identify evidence based best practices for the management of the cognitive symptoms of pediatric concussion in the academic setting. Critical appraisal of the literature is defined as “a systemic, unbiased, careful examination of all aspects of a study to judge the merits, limitations, meaning, and significance (Burns & Groves, 2012, p. 598). A critical appraisal of the research involves four steps: comprehension, comparison, analysis, and evaluation and conceptual clustering (Burns & Groves, 2012). Guidelines for the critical appraisal of the literature include: examination of the expertise of the authors, reviewing the entire study, examination of strengths and weakness of each study, and evaluation of the study for its contribution to nursing practice (Burns & Groves, 2012). A critical appraisal table was then utilized to summarize the findings from the appraisal and to rank the evidence from Level I evidence being the strongest to Level VII evidence being the weakest (Appendix A).

### **Search Results**

A search of the CINAHL and PubMed databases was conducted for literature published between 2009 and 2015. The CINAHL search involved a combination of keywords including brain concussion, cognitive rest, concussion, rehabilitation, return to learn, school accommodations, and school reentry. The initial inclusion criteria for the CINAHL database search were: peer reviewed literature, evidence based practice, age groups: child six – twelve years and adolescent thirteen – eighteen years, English language, and publication date between

2009 and 2015. However, there were zero results with these inclusion criteria. The same keywords used with a search for only English language results between the years of 2009 – 2015. Exclusion criteria included moderate/severe head injury, adult patients only, full article not available, and abstract only available. All of the search results were then reviewed to determine if they met the inclusion and exclusion criteria. The PubMed search involved a combination of keywords including cognitive rest, concussion, return to learn, school accommodations, and school reentry. Inclusion criteria were articles dated from 2009 to 2015, of these article types: clinical trial, meta-analysis, practice guideline, review, systematic reviews, English language articles, and child from birth to eighteen years. Exclusion criteria again included moderate/severe head injury, adult patients only, full article unavailable, and abstract only available. It is possible that some literature was missed as the search strategy only included English language literature. Reference lists from retrieved literature from both databases were reviewed for additional relevant articles. A search of relevant websites and gray literature was conducted to locate guidelines not published in academic literature. Based on these search criteria, twenty-three articles and guidelines meet the inclusion criteria and were analyzed via the critical appraisal table (Appendix A).

### **Discussion of Rights of Human Subjects and the Consent/Review Process**

An application was submitted to the University of Alaska Anchorage Institutional Review Board and the project chair and committee for approval. This project was exempted as it did not utilize human subjects.

### **Results**

The twenty-three articles identified during the CINAHL and PubMed databases search were reviewed and cataloged in a critical appraisal table (Appendix A). Each critical appraisal

table contained the following information: American Psychological Association citation, research design/level of evidence, article/study purpose, sample population, method, findings, limitations, strengths, and implications. Each article's level of evidence was determined via use of a rating system from Burns and Groves (2012) for hierarchy of evidence. Articles were deemed Level I evidence if they were from a systematic review of all relevant randomized controlled trials (RCTs) or evidence-based clinical practice guidelines based on systematic reviews of RCTs. An article was assigned Level II if evidence was obtained from at least one well-designed RCT. Level III evidence was obtained from well-designed controlled trials without randomization, or quasi-experimental. Level IV evidence was generated from well-designed case-control and cohort studies. Level V evidence included systematic reviews of descriptive or qualitative studies. Level VI evidence was from a single descriptive or qualitative study. Lastly, Level VII evidence included was opinion of authorities or reports of expert committees (Burns & Groves, 2012).

Of the twenty-three articles that met the inclusion criteria, twenty-one articles were Level VII evidence. Two articles were considered Level VI evidence: a prospective cohort study conducted by Brown et al. (2014) and a retrospective cohort study conducted by Gibson, Nigrovic, O'Brien, & Meehan III (2014). The majority of the literature on which the return to learn protocol is based is Level VII evidence, or expert opinion.

There were several themes identified throughout the critical appraisal process as critical to a successful return to learn protocol: post-concussion diagnosis, cognitive rest, the circumstances that should occur for the student to return to school, academic accommodations, and symptom monitoring. An academic accommodations grid and return to learn protocol was developed based on this critical appraisal of the literature. All of the critically appraised articles and

guidelines were used in the development of the academic accommodations grid and return to learn protocol.

### **Return to Learn**

The critical appraisal of the literature showed consensus regarding the management of the pediatric concussion in the academic environment; however there is a distinct lack of research surrounding the return to learn process. A return to learn protocol should involve incremental increases in cognitive activity while staying below the student's symptom threshold, monitoring the student for symptom exacerbation, and providing academic accommodations as needed (Baker et al., 2014; Davis & Purcell, 2014). Each student will progress through a return to learn protocol at his/her own pace based on symptomology, number of previous concussions, and comorbidities (Baker et al., 2014; Gioia et al., 2014). Each student's return to learn plan should be individualized to best accommodate particular needs (Baker et al., 2014). The proposed return to learn protocol (Appendix C) was created based on the current literature and incorporates expert recommendations.

### **Post-concussion Diagnosis**

Once a pediatric student has been diagnosed with a concussion, the parents or legal guardians should contact the student's school to request a meeting with teachers and school administrators to facilitate the student's return to the academic environment (Popoli et al., 2014; Reiger, 2012). During this meeting, the student's concussion symptoms can be discussed, as well as how symptoms may affect the student's ability to participate in the academic environment (Popoli et al., 2014). The parents or legal guardians in collaboration with school personnel and the medical provider should arrange for a gradual return to school with appropriate accommodations for the student's symptomology (Baker et al., 2014; Halstead et al., 2013). The

importance of this collaboration cannot be overstated as it lays the foundation for open communication between all parties responsible for the management of the student's concussion.

### **Cognitive Rest**

Although there is consensus that the backbone of concussion management is physical rest in combination with cognitive rest; there is no evidence to guide decision-making regarding the optimal amount of cognitive rest for pediatric concussion patients. A prospective cohort study conducted by Brown et al. (2014) found that increased cognitive activity was associated with longer recovery times from concussion. Brown et al. (2014) recommends that cognitive rest be incorporated into concussion management plans, but does not make recommendations on the duration of cognitive rest. Gibson et al. (2013) conducted a retrospective cohort study and did not find an independent association between the recommendation of cognitive rest and the duration of concussive symptoms. This study included adult participants, and may not be generalizable to the pediatric patient; the authors of the study recommended full cognitive rest for two to seven days (Gibson et al., 2013). These two studies were the only studies on cognitive rest found in the literature search; these two studies alone do not provide a high enough level of evidence upon which to base recommendations, beyond the agreement that cognitive rest is recommended.

The remaining literature regarding cognitive rest is based on expert opinion and the current knowledge regarding the pathophysiology of concussion. Recommendations for the duration of cognitive rest ranges from twenty-four hours to one week. A minimum of twenty-four hours of complete cognitive rest is recommended by the Defense and Veterans Brain Injury Center (2014). Brown et al. (2014) does not recommend complete cognitive rest when managing concussion, but does advise that the student should not participate in activities that cause

cognitive exertion. Baker et al. (2014) endorses complete cognitive rest with minimal cognitive activity for one to three days, or until the most significant symptoms have resolved. Gioia et al. (2014) and Zemek et al. (2014) recommend one to two days of cognitive rest, although both authors acknowledge that the ideal duration of cognitive rest is currently unknown. McGrath (2010) is non-specific in his recommendation of “a few days of complete rest immediately post-injury” (p. 494). Popoli et al. (2014) and Grady, Master and Gioia (2012) recommend three days or less of cognitive rest. DeMatteo et al. (2015) were the most conservative, with their recommendation of cognitive rest for seven days. There are numerous authors who recommend cognitive rest after initial diagnosis of concussion, but do not recommend a specific time frame (Davis & Purcell, 2014; Oregon Concussion and Management Program, 2011). Although the ideal duration for cognitive rest is unknown, the majority of the current research recommends between one to three days of cognitive rest. As such, this is the amount of cognitive rest recommended in the return to learn protocol (Appendix C).

### **When to Return to School**

The mainstay in the decision to return a child to school is his/her ability to complete cognitive tasks in small blocks, without symptom exacerbation or reemergence. If symptoms worsen or reemerge, the student may still return to school if rest breaks would resolve the symptoms. Maintaining an appropriate balance between cognitive exertion and rest is integral to the student’s transition back to school, and successful completion of a return to learn protocol.

The majority of the literature reviewed places the responsibility for determining the student’s readiness to return to school following a concussion on the parents (Halstead et al., 2013; McAvoy, 2012). Gioia (2014) is the only author in the critical appraisal who recommends the medical provider making the recommendation for the student’s return to school. As

discussed in the literature review, parents should be encouraged to return their child to school as soon as possible, to prevent symptoms such as depression and anxiety. Education for the parents should emphasize that the student does not need to be symptom free to return to school (DeMatteo et al., 2015; McAvoy, 2012; Purcell, 2014). Prolonged absences from school may have more substantial consequences that might not be justified, given the current level of evidence for cognitive rest (Gibson, et al., 2013; Popoli et al., 2014). The return to school decision should be made by the student's parents or legal guardians, with the goal of return the student to a normal social environment as soon as tolerated.

While the pediatric patient is home on cognitive rest, parents can assess readiness to return to the academic environment by gradually increasing activities at home while staying below the student's symptom threshold (Baker et al., 2014; Davis & Purcell, 2014). Parents should be educated regarding the definition of cognitive activity: any activity that requires concentration, attention, and increased thinking (Brown et al., 2014). Patients should be instructed that if a particular activity exacerbates symptoms, the student should stop that activity (Master et al., 2012). Parents can assess the student's ability to return to school by the pacing of cognitive activities (Baker et al., 2014; Master et al., 2012). Pacing involves the intermixing of cognitive activity with rest breaks, allowing the student to stay below symptom threshold (Baker et al., 2014). Sady et al. (2011) recommend pacing cognitive activities in fifteen-minute increments and alternating short bursts of activity with rest periods as long as cognitive overexertion does not occur. DeMatteo et al. (2015) states that if the student is able to complete two fifteen minute sessions of screen time and walking without symptom exacerbation or reemergence, he/she may return to school (DeMatteo et al., 2015). Gioia et al. (2014) proposes that the student is able to return to school when he/she can tolerate at least thirty minutes of

cognitive activity with mild symptom exacerbation, so long as cognitive rest causes a reduction in the symptoms. The pacing of cognitive activities is recommended by several authors as a way to determine a student's readiness for the academic environment; there is no evidence regarding the optimal procedure for pacing.

There are also numerous opinions about how much cognitive activity the student should be able to tolerate without symptom reemergence or exacerbation prior to returning to school. Halstead et al. (2013) recommends that students not return to school until they are capable of thirty to forty-five minutes of sustained cognitive activity without the reemergence or worsening of symptoms. Davis & Purcell (2014) advise that once students are able to complete homework for thirty to forty-five minutes without any reemergence of concussion symptoms, they may return to a half-day of school. School re-entry should be considered when the student is able to complete two hours of homework in thirty to forty-five minute intervals (Master et al., 2012). McAvoy (2012), Grady et al., (2014), and Gioia (2014) suggest allowing students to return to school if they can sustain concentration for thirty minutes before significant symptom exacerbation and their symptoms diminish or dissipate with cognitive rest. Ultimately, it seems reasonable that a student be able to tolerate at least one class period prior to returning to school. Based on this information, the return to learn protocol developed for the Anchorage School District recommends that a student be able to tolerate thirty to forty five minutes of cognitive activity without cognitive overexertion prior to returning to school.

The duration of school that the student should attend is based on individual symptomology. Initially, students should return to school at most on a part time basis (Baker et al., 2014). If possible, the courses that the student attends should be prioritized in order to allow the student to attend each of their classes weekly (Sady et al., 2011). As students progress



through the return to learn protocol and begin to recover, the amount of time spent at school should be increased until they reach a full day of school.

### **Academic Accommodations**

There have been no studies conducted regarding the efficacy of academic accommodations, however it is likely that academic accommodations in conjunction with cognitive rest speed recovery (Brown et al., 2014). There are numerous recommendations regarding academic accommodations; but again, these are based on expert opinion and current knowledge of the pathophysiology of concussion. The level of academic accommodations should be decided in collaboration with the parent, student, school, and medical provider based on the individual student's symptoms (Halstead et al., 2013). Appendix B reflects the current recommendations for academic accommodations based on symptoms.

Academic accommodations should be implemented upon the student's return to school. The academic accommodations should be based on the student's individual symptoms (Davis & Purcell, 2014; Reiger, 2012). Cognitive rest breaks should be initially built into the student's schedule regardless of individual symptoms to prevent cognitive overexertion (Baker et al., 2014). Academic accommodations should be reviewed weekly, based on the student's progress through the return to learn process in order to adapt accommodations to current symptoms (Halstead et al., 2013).

### **Symptom Monitoring**

Symptom monitoring is an integral part of the return to learn process. The student, parents, and school personnel should be involved in this process. The student and parents should complete symptoms logs to track the student's progress, and provide the logs to a selected school personnel member (e.g. registered nurse) for monitoring. The student's ability to proceed

through the return to learn process is based on the school's ability to accommodate the symptoms of the concussion in the academic environment. Symptom checklists should include the symptoms that a student may experience and the ability to rate the symptoms by severity (Halstead et al., 2013; McAvoy, 2009). Frequent assessment of the student's symptoms should be made so that academic accommodations can be adjusted as concussion symptoms evolve (Baker et al., 2014; Halstead et al., 2013). There is currently no standard for the frequency of symptom monitoring. McAvoy (2012) recommends daily symptom monitoring for the first week, every other day monitoring for the second week, and twice weekly monitoring for the third week. Symptom monitoring may also be individualized to the particular student and his/her recovery process.

The Sport Concussion Assessment Tool 3 (SCAT3) (Appendix D) can be adapted to monitor concussion symptoms in the pediatric population (Baker et al., 2014). The SCAT3 should be used for students ages thirteen and older, and the ChildSCAT3 (Appendix E) should be used for students between the ages of five and twelve (Baker et al., 2014). There are sections in the ChildSCAT3 for the child and the parent reporting of symptoms. The SCAT3 and ChildSCAT3 have not been validated, but are widely used to diagnose and monitor concussion by major organizations such as the National Football League. There are numerous other symptom logs that can be used to monitor symptoms; however the permission of the author of the symptom log should be obtained prior to its use. The Anchorage School District could also choose to create their own symptom log, as the Child-SCAT3 and SCAT3 have not been validated in the pediatric population (Purcell, 2014).

### **Dissemination Plan**

A copy of the return to learn protocol and Power Point poster will be provided to the

Anchorage School District for training purposes. The return to learn protocol will also be submitted for exhibition at the Anchorage School District's Biannual Nursing Conference in 2016, the Alaska School Nurses Association's Annual Spring Conference in April 2016, and the Alaska Nurse Practitioner Association Conference in September 2015.

### **Implications and Recommendations for Further Study**

- There is currently insufficient data to advocate the ideal management of return to learn in the pediatric population.
- Further research needs to be conducted regarding all aspects of pediatric concussion.
- Cognitive rest as a construct needs to be better defined to guide practice recommendations.
- Further research is needed regarding the efficacy of cognitive rest protocols.
- Further research is also needed to evaluate the long-term outcomes of cognitive rest, the optimal amount of cognitive rest, and the type of cognitive rest.
- Empirical research might be conducted to translate current guidelines for rest into evidence-based treatment protocols.
- Further research could examine concussion in elementary aged students and female students.
- There is a need for validated age-specific return to learn protocols.

## References

- Arbogast, K. B., McGinley, A. D., Master, C. L., Grady, M. F., Robinson, R. L., & Zonfrillo, M. R. (2013). Cognitive rest and school-based recommendations following pediatric concussion – The need for primary care support tools. *Clinical Pediatrics, 18*, 376 – 382.
- Baker, J. G., Rieger, B. P., McAvoy, K., Leddy, J. J., Master, C. L., Lana, S. J., & Willer, B. S. (2014). Principles for return to learn after concussion. *International Journal of Clinical Practice, 68*(11), 1286 – 1288.
- Brown, N. J., Mannix, R. C., O'Brien, M. J., Gostine, D., Collins, M. W., & Meehan, W. P. (2014). Effect of cognitive activity level on the duration of post-concussive symptoms. *Pediatrics, 133*(2), 299 – 304.
- Burns, N. & Grove, S. K. (2012). *The practice of nursing research: Appraisal, synthesis, and generation of evidence* (6<sup>th</sup> ed.). St. Louis, MO: Saunders Elsevier.
- Centers for Disease Control and Prevention (CDC). (2007). *Heads up. Facts for Physicians about Mild Traumatic Brain Injury (MTBI)*.
- Centers for Disease Control and Prevention (CDC). *Returning to school after a concussion: A fact sheet for school professionals*. Retrieved on May 5, 2015 from <http://www.cdc.gov/headsup/schools/teachers.html>
- Centers for Disease Control and Prevention (CDC). (2011). *A “heads up” on managing return to play*. Retrieved on February 15, 2015 from [http://www.cdc.gov/concussion/headsup/return\\_to\\_play.html](http://www.cdc.gov/concussion/headsup/return_to_play.html)
- Colorado Department of Education. (2014). *Concussion management guidelines*. Retrieved from <http://www.cde.state.co.us/HealthandWellness/BrainInjury.html>.

- Davis, G. A., & Purcell, L. K. (2014). The evaluation and management of acute concussion differs in young children. *British Journal of Sports Medicine*, *48*, 98 – 101.
- Defense and Veterans Brain Injury Center. (2014). *A parent's guide to returning your child to school after a concussion*. Retrieved from <https://dvbic.dcoe.mil/material/parental-guide-returning-your-child-school-after-concussion>.
- DeMatteo, C., McCauley D., Stazyk, K., Harper, J., Adamich, J., Randall, S., & Missiuma, C. (2014). Post-concussion return to play and return to school guidelines for children and youth: A scoping methodology. *Disability and Rehabilitation*, 1 – 6.
- DeMatteo, C., Stazyk, K., Giglia, L., Mahoney, W., Singh, S. K., Hollenberg, R., Harper, J. A., Missiuma, C., Law, M., McCauley, D., & Randall, S.(2015). A balanced protocol for return to school for children and youth following concussive injury. *Clinical Pediatrics*, 1 – 10.
- Eisenberg, M. A., Meehan III, W. P., & Mannix, R. (2014). Duration and course of post-concussive symptoms. *Pediatrics*, *133*(6), 999 – 1006.
- Evans, R.W. (2014). Postconcussion syndrome. In: UpToDate, Bascow, DS (Ed), UpToDate, Waltham, MA.
- Gibson, S., Nigrovic, L. E., O'Brien, M., & Meehan III, W. P. (2013). The effect of recommending cognitive rest on recovery from sport-related concussion. *Brain Injury*, *27*(7 – 8), 839 – 842.
- Gioia, G. A. (2012). Pediatric assessment and management of concussions. *Pediatric Annals*, *41*(5), 198 – 203.
- Gioia, G. A. (2014). Medical-school partnership in guiding return to school following mild traumatic brain injury in youth. *Journal of Child Neurology*, 1 – 16.

- Gioia, G., Vaughan, C., & Reesman, J. (2010). Characterizing post-concussion exertional effects in the child and adolescent. *Journal of International Neuropsychological Society, 16*(S1), 178 - 182.
- Giza, C. C. (2014). Pediatric issues in sports concussion. *Continuum: Lifelong Learning in Neurology, 20*(6), 1570 – 1587.
- Grady, M. F. (2010). Concussion in the adolescent athlete. *Current Problems in Pediatric and Adolescent Health Care, 40*(7), 154 – 169.
- Grady, M. F., Master, C. L., & Gioia, G. A. (2012). Concussion pathophysiology: Rationale for physical and cognitive rest. *Pediatric Annals, 41*(9), 377 – 378.
- Halstead, M. E., McAvoy, K., Devore, C. D., Carl, R., Lee, M., & Logan, K. (2013). Returning to learning following a concussion. *Pediatrics, 132*(5), 948 -957.
- Harmon, K. G., Drezner, J., Gammons, M., Guskiewicz, K., Halstead, M., Herring, S., Kutcher, J., Pana, A., Putukian, M., & Roberts, W. (2013). American medical society for sports medicine position statement: Concussion in sport. *Clinical Journal of Sports Medicine, 23*(1), 1 – 18.
- Howell, D., Osternig, L., Van Donkelaar, P., Mayr, U., & Chou, L. S. (2013). Effects of concussion on attention and executive function in adolescents. *Medicine and Science in Sports and Exercise, 45*(6), 1030 – 1037.
- Karlin, A. M. (2011). Concussion in the pediatric and adolescent population – Different population, different outcomes. *PM&R, 3*, S369 – S379.
- Kozier, B. (Ed.). (2008). *Fundamentals of nursing: concepts, process and practice*. (8<sup>th</sup> ed.). Upper Saddle River, NJ: Pearson Education:

- Lee, M. A., & Perriello Jr., V. A. (2009). Adolescent concussions – Management guidelines for schools. *Connecticut medicine*, 73(3), 171.
- Lovell, M. R., & Fazio, V. (2008). Concussion management in the child and adolescent athlete. *Current Sports Medicine Reports*, 7(1), 12 – 15.
- Marsh, A. M., Fraser, D., & Marsh, J. P. (2013). Management of concussion in the pediatric population. *Journal of Pediatric Health Care*, 27(6), 499 – 504.
- Master, C. L., Gioia, G. A., Leddy, J. J., & Grady, M. F. (2012). Importance of ‘return-to-learn’ in pediatric and adolescent concussion. *Pediatric Annals*, 41(9), 1 – 6.
- Maugans, T. A., Farley, C., Altaye, M., Leach, J., & Cecil, K. M. (2012). Pediatric sports-related concussion produces cerebral blood flow alterations. *Pediatrics*, 129(1), 28-37.
- McAvoy, K. (2009). *REAP the benefits of good concussion management*. Centennial, CO: Rocky Mountain Sports Medicine Institute Center for Concussion. Retrieved from [http://issuu.com/healthone/docs/reap\\_april\\_2011](http://issuu.com/healthone/docs/reap_april_2011).
- McAvoy, K. (2012). Return to learning: going back to school following a concussion. *Communique Online*, 40(6), 1.
- McCrory, P., Meeuwisse, W. H., Aubry, M., Cantu, B., Dvořák, J., Echemendia, R. J., Johnston, K., Kutcher, J. S., Raftery, M., Sills, A., Benson, B. W., Davis, G. A., Ellenbogen, R. G., Guskiewitz, K., Herring, S. A., Iverson, G. L., Jordan, B. D., Kissick, J., McCrea, M., McIntosh, A. S., Maddocks, D., Makdissi, M., Purcell, L., Putukian, M., Schneider, K., Tator, C. H., & Turner, M. (2013). Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012. *British Journal of Sports Medicine*, 47(5), 250-258.

- McGrath, N. (2010). Supporting the student-athlete's return to the classroom after a sports-related concussion.
- McLeod, T. (2010). Cognitive rest: The often neglected aspect of concussion management. *Athletic Therapy Today*, 15(2), 1 – 3.
- McLeod, T. (2014). Managing concussion in the school setting. *NASN School Nurse*, 29(5), 232 – 235.
- Meckler, S. E. (2014). Clinical management of sports-related pediatric concussions. *Clinician Reviews*, 24(9), 24 – 32.
- Moser, R. S., Glatts, C., & Schatz, P. (2012). Efficacy of immediate and delayed cognitive and physical rest for treatment of sports-related concussion. *The Journal of Pediatrics*, 161(5), 922-926.
- Moser, R. S., & Schatz, P. (2012). A case for mental and physical rest in youth sports concussion: It's never too late. *Frontiers in Neurology*, 3, 1 – 6.
- Oregon Concussion and Management Program. (2011). *Concussion management – Policy and resource handbook*. Retrieved from [www.orcasinc.com](http://www.orcasinc.com).
- Piebes, S. K., Gourley, M., & McLeod, T. C. (2009). Caring for student-athletes following a concussion. *The Journal of School Nursing*, 25(4), 270 – 281.
- Popoli, D. M., Burns, T. G., Meehan III, W. P., & Resiner, A. (2014). CHOA concussion consensus: Establishing a uniform policy for academic accommodations. *Clinical Pediatrics*, 53(3), 217 – 224.
- Purcell, L. K. (2009). What are the most appropriate return-to-play guidelines for concussed child athletes? *British Journal of Sports Medicine*, 43, 51 – 55.



- Purcell, L. K. (2014). Sport-related concussion: Evaluation and management. *Paediatrics & Child Health, 19*(3), 153 – 165.
- Rains, C. A., & Robinson, B. (2010). School nurses and athletic trainers team up on concussion management. *NASN School Nurse, 25*(5), 234 – 238.
- Reiger, B. (2012). Suggestions for facilitating return to learn after concussion. *Brain Injury Professional, 9*(1), 22 – 24.
- Sady, M. D., Vaughan, C. G., & Gioia, G. A. (2011). School and the concussed youth – recommendations for concussion education and management. *Physical Medicine and Rehabilitation Clinics of North America, 22*(4), 701 – 719.
- West, T. A., & Marion, D. W. (2014). Current recommendations for the diagnosis and treatment of concussion in sport: A comparison of three new guidelines. *Journal of Neurotrauma, 31*(2), 159 – 168.
- Zemek, R., Duval, S., Dematteo, C., Solomon, B., Keightley, M., & Osmond, M. (2014). *Guidelines for diagnosing and managing pediatric concussion*. Toronto, ON: Ontario Neurotrauma Foundation.

Appendix A  
Critical Appraisal Table

<b>APA Citation</b>	Baker, J. G., Rieger, B. P., McAvoy, K., Leddy, J. J., Master, C. L., Lana, S. J., & Willer, B. S. (2014). Principles for return to learn after concussion. <i>International Journal of Clinical Practice</i> , 68(11), 1286 – 1288.	Brown, N. J., Mannix, R. C., O'Brien, M. J., Gostine, D., Collins, M. W., & Meehan, W. P. (2014). Effect of cognitive activity level on the duration of post-concussive symptoms. <i>Pediatrics</i> , 133(2), 299 – 304.	Colorado Department of Education. (2014). <i>Concussion management guidelines</i> . Retrieved from <a href="http://www.cde.state.co.us/HealthandWellness/BrainInjury.html">http://www.cde.state.co.us/HealthandWellness/BrainInjury.html</a> .	Davis, G. A., & Purcell, L. K. (2014). The evaluation and management of acute concussion differs in young children. <i>British Journal of Sports Medicine</i> , 48, 98 – 101.
<b>Research Design/ Level of Evidence</b>	Level VII evidence – Literature review.	Level IV evidence – Prospective cohort study.	Level VII evidence – Management guideline.	Level VII evidence – Literature review.
<b>Article/ Study Purpose</b>	To propose principles and practical guidance for the pediatric population in resuming academic activities after the diagnosis of concussion.	To determine the effect of cognitive activity level on the duration of post-concussion symptoms.	To provide guidance to school superintendents as they implement concussion management guidelines within a school district.	(1) To review the current literature on concussion assessment at the sideline and during recovery stages in the age group of five to fifteen years. (2) To review the current literature for the management of concussion in children and adolescents.
<b>Sample Population</b>	N/A.	Convenience sample of patients who presented to a sports concussion clinic within three weeks of injury between October 2009 and July 2011.	N/A.	N/A.

<b>Method</b>	N/A.	Patients completed a scale that recorded their average level of cognitive activity since the previous visit. Kaplan-Meier product limit method was used to generate curves of symptom duration based on cognitive activity level.	N/A.	Literature review using the MEDLINE database. Articles selected included the evaluation and/or management of concussion in children aged five to fifteen years.
<b>Findings</b>	A flexible, graduated return to learn protocol and set of core academic accommodations should be implemented in the management of pediatric concussion in the academic setting. A limited period of cognitive rest for one to three days is recommended until the most significant concussion symptoms have resolved.	Increased cognitive activity is associated with longer recovery from concussion. Patients in the highest quartile of cognitive activity-days took statistically longer to recover than those in the first to third quartiles of cognitive activity-days according to the Cognitive Activity Scale.	Students should return to school once the symptoms from their concussion are manageable with academic accommodations to minimize social disruptions. The recovery process differs between students and also between concussions in the same student. Physical and cognitive rest is beneficial to the recovery process from concussion.	The management of pediatric concussion includes cognitive and physical rest. The priority of concussion management in children is returning to the academic environment. Return to learn should precede return to play. A stepwise approach of increasing cognitive activity allows students to return to learn without exacerbating their symptoms.
<b>Limitations</b>	Recommendations are specific to the recovery period of up to two weeks post-concussion.	Convenience sample. The Cognitive Activity Scale used in this study was not been previously validated. Participants ranged from age eight to twenty-three years with a	Management guideline is based on current literature, expert opinion, and expert review. There is limited high-level data to reference in this guideline; more research is required to	The literature that was reviewed was low-level evidence.

		mean age of fifteen. Parents may have assisted younger athletes with completing the scale, which may have altered the answers.	empirically validate the presented guideline.	
<b>Strengths</b>	Synthesis of current guidelines.	International Consensus of Concussion in Sports definition was used to identify study patients.	Guideline was updated from the 2012 version with current literature.	Validates the knowledge gap in concussion management for the pediatric population.
<b>Implications</b>	There is limited empirical data specifically addressing the academic effects of concussion in the pediatric population. While, there is an emerging consensus on the optimal process for return to school, there is still a paucity of research on the return to learn process.	Contributes prospective data to the current consensus opinion that limiting extensive cognitive activity reduces duration of concussion symptoms. Supports the use of cognitive rest and adds empirical support to the practice of putting academic accommodations in place for student-athletes suffering from sport-related concussions.	School districts should have a return to learn protocol to guide the process of recovery for students who have been diagnosed with concussion.	Age-specific, validated diagnostic tools for pediatric concussion are necessary. Currently, there are no clear evidence-based guidelines for return to school for youth who have suffered a concussion.

<b>APA Citation</b>	Defense and Veterans Brain Injury Center. (2014). <i>A parent's guide to returning your child to school after a concussion</i> . Retrieved from <a href="https://dvbic.dcoe.mil/material/parental-guide-returning-your-child-school-after-concussion">https://dvbic.dcoe.mil/material/parental-guide-returning-your-child-school-after-concussion</a> .	DeMatteo, C., Stazyk, K., Giglia, L., Mahoney, W., Singh, S. K., Hollenberg, R., Harper, J. A., Missiuma, C., Law, M., McCauley, D., & Randall, S. (2015). A balanced protocol for return to school for children and youth following concussive injury. <i>Clinical Pediatrics</i> , 1 – 10.	DeMatteo, C., McCauley D., Stazyk, K., Harper, J., Adamich, J., Randall, S., & Missiuma, C. (2014). Post-concussion return to play and return to school guidelines for children and youth: A scoping methodology. <i>Disability and Rehabilitation</i> , 1 – 6.	Gibson, S., Nigrovic, L. E., O'Brien, M., & Meehan III, W. P. (2013). The effect of recommending cognitive rest on recovery from sport-related concussion. <i>Brain Injury</i> , 27(7 – 8), 839 – 842.
<b>Research Design /Level of Evidence</b>	Level VII evidence – Management guideline.	Level VII evidence - Knowledge translation research.	Level VII evidence – Scoping methodology.	Level IV evidence – Retrospective cohort study.
<b>Article/ Study Purpose</b>	To provide a guide to address the successfully return of a student to school following a concussion.	(1) To develop evidence-based materials to educate and update medical professionals about pediatric concussion. (2) To develop a return to school protocol.	To identify and describe management strategies to ensure safe return to activity and return to school of children with mild traumatic brain injury and to determine whether they are evidence-based.	To determine whether recommending cognitive rest to athletes after a sport-related concussion affects time to symptom resolution.
<b>Sample Population</b>	N/A.	N/A.	N/A.	184 patients who presented to a sports concussion clinic in an academic medical center between November 2007 and July 2009.
<b>Method</b>	N/A.	The return to school	A scoping methodology	The effect of

	<p>protocol was developed according to the National Institute for Health and Care Excellence’s guideline development strategy.</p>	<p>was conducted using research published between 1990 and 2013, grey literature, and clinical expertise.</p>	<p>recommending cognitive rest on symptom duration was measured after adjusting for age, gender, initial PCSS score, history of amnesia, history of loss of consciousness and number of previous concussions. Using multivariate logistic regression, independent predictors of prolonged symptoms were identified, defined as greater than thirty days.</p>
<p><b>Findings</b></p>	<p>A minimum of twenty-four hours of cognitive rest is recommended for students who have sustained a concussion. Students should track concussion symptoms in a symptom log to determine whether they are getting better or worse. Cognitive activity should be gradually reintroduced, but any activity that causes symptoms to return should be ceased.</p>	<p>A balance of cognitive rest and timely return to school needs to be considered in a protocol for returning any student to school after a concussion. Little guidance is available as to how much cognitive rest is needed, how much time off of school is recommended, and what to do when children have difficulties with school routines.</p>	<p>Most comprehensive guidelines for the management strategies for mild traumatic brain injury are focused on adults. Evidence concerning prolonged recovery patterns in children and the impact of concussion on the developing brain suggests that pediatric-specific guidelines are needed for return to activity and return to school after mild traumatic brain injury /concussion.</p> <p>Given the limited evidence regarding the effects of cognitive rest on recovery from concussion, recommendations of prolonged periods of cognitive rest, particularly absences from school, should be approached cautiously. After an initial period of full cognitive rest of two to seven days in duration, a gradual re-emergence into schoolwork is recommended.</p>

<b>Limitations</b>	The information for the recommended steps to return to learn is limited and often vague.	Limited high level research evidence; therefore, the protocol was developed with information extrapolated from biomedical research and adult concussion consensus information.	There is no research data, very few academic articles and most of the information available on websites and iPad applications were reproductions of the Zurich Consensus guidelines. Literature may have been missed as the search strategy included only English literature and websites.	Patients referred to this clinic had longer durations of symptoms than participants in other studies, thus representing a referral bias and limiting the generalizability of the findings. The study was retrospective, without intervention or instructions given to the treating clinicians. Participants ranged in age from eight to twenty-six years. Seventy-two percent of the patients were male.
<b>Strengths</b>	Extensive reference list of relevant and up-to-date articles.	A scientific method was followed to develop the protocol, which included consensus and pilot testing of the protocol. Protocol is recommended for use in children ages four to eighteen years.	Expert opinion of a panel of physicians and clinicians working in the field of childhood and traumatic brain injury was an integral part of the literature review and served to enhance interpretation of the published literature.	Patient who were not recovered by the end of the study were not used in the final statistical analysis.
<b>Implications</b>	Cognitive rest and symptom tracking is an essential part of returning to the classroom.	Research in this field is in the early stages of development and as a result does not meet the standards for appraisal of evidence set by the	Guidelines need to be developed that reflect the specific needs and responses of children and youth with concussion. Future research is needed	This study found that the current evidence supporting the role of cognitive rest is limited. This study did not identify an independent

	Centre for Evidence Based Medicine. Evidence based child specific return to school protocols are needed.	to bring together the supporting evidence that is available to develop guidelines for the pediatric population.	association between the recommendation of cognitive rest and duration of concussive symptoms. Current evidence supporting the role of cognitive rest is limited.
--	--	---	--



<b>APA Citation</b>	Gioia, G. A. (2014). Medical-school partnership in guiding return to school following mild traumatic brain injury in youth. <i>Journal of Child Neurology</i> , 1 – 16.	Grady, M. F. (2010). Concussion in the adolescent athlete. <i>Current Problems in Pediatric and Adolescent Health Care</i> , 40(7), 154 – 169.	Grady, M. F., Master, C. L., & Gioia, G. A. (2012). Concussion pathophysiology: Rationale for physical and cognitive rest. <i>Pediatric Annals</i> , 41(9), 377 – 378.	Halstead, M. E., McAvoy, K., Devore, C. D., Carl, R., Lee, M., & Logan, K. (2013). Returning to learning following a concussion. <i>Pediatrics</i> , 132(5), 948 -957.
<b>Research Design /Level of Evidence</b>	Level VII evidence – Literature review.	Level VII evidence – Expert opinion.	Level VII evidence – Expert opinion.	Level VII evidence – Expert opinion.
<b>Article/ Study Purpose</b>	To provide medical providers and school systems with a joint, collaborative approach to assist the recovering student with school reintegration.	To review the current understanding of the epidemiology, pathophysiology, and clinical presentation of concussion and discuss the unique factors involved in clinical management of concussion in the adolescent student-athlete.	To address the foundation of the concept of cognitive rest, which is the most common treatment prescription for concussion management.	To provide a better understanding of the factors that contribute to difficulties in school after a concussion and to provide a framework to guide the student to a safe return to learning.
<b>Sample Population</b>	N/A.	N/A.	N/A.	N/A.
<b>Method</b>	N/A.	N/A.	N/A.	N/A.
<b>Findings</b>	A cookie-cutter approach to the management of pediatric concussion in the school setting is not recommended. Return to learn protocols require management and	The pathophysiology of concussion suggests that cognitive and physical rest is critical during the acute healing phase. In individuals with mild symptoms, a few days of	Consider keeping a student home from school for one to three days post-concussion. Discuss with school officials the necessity for a careful balance of	Students with a concussion may need academic adjustments to minimize worsening of concussion symptoms. Most concussions resolve within three weeks of the

	knowledge by both the medical providers and the academic team members.	rest at home before returning to school is typically well tolerated.	activity and rest during the student's school day with close symptom monitoring. Allow a gradual increase in cognitive activity as symptoms allow, monitoring for an increase in symptoms.	injury, academic adjustments may often be made in the individual classroom setting without formal written plans, such as a 504 plan or IEP. Students should be performing at their academic baseline before returning to sports or other extracurricular activities following a concussion.
<b>Limitations</b>	Scant evidence-based literature currently exists to guide the return to school process.	Focuses on middle school and high school students. Article is based mostly on expert opinion and low-level evidence.	Article is based mostly on expert opinion and low-level evidence.	Article is based on expert opinion.
<b>Strengths</b>	Guideline was developed using return to school programs for children with other neurological and medical disorders such as migraine.	Author is a concussion consultant for the state of Philadelphia.	Author is a concussion consultant for the state of Philadelphia.	Clinical report from the American Academy of Pediatrics.
<b>Implications</b>	The management of mild concussion in the school setting can borrow from other areas of research and practice until it has achieved its own evidence base. There is a significant need to develop a solid evidence	Lack of prospective studies in early adolescent student athletes limits definitive management recommendations. Cognitive rest is essential during the acute healing phase of concussion.	Return-to-school after a concussion is a significant aspect of concussion management and requires evidence-based practice guidelines.	Data is currently insufficient to advocate the ideal way to manage return to learn in the pediatric population. Additional research is necessary to strengthen and provide more evidence-based

base to better understand the effects of concussion in the developing child especially in regards to returning to the classroom.

recommendations for appropriate academic adjustments for students following a concussion.

<b>APA Citation</b>	Master, C. L., Gioia, G. A., Leddy, J. J., & Grady, M. F. (2012). Importance of 'return-to-learn' in pediatric and adolescent concussion. <i>Pediatric Annals</i> , 41(9), 1 – 6.	McAvoy, K. (2009). <i>REAP the benefits of good concussion management</i> . Centennial, CO: Rocky Mountain Sports Medicine Institute Center for Concussion. Retrieved from <a href="http://issuu.com/healthone/docs/reap_april_2011">http://issuu.com/healthone/docs/reap_april_2011</a> .	McAvoy, K. (2012). Return to learning: Going back to school following a concussion. <i>Communique Online</i> , 40(6), 1.	McGrath, N. (2010). Supporting the student-athlete's return to the classroom after a sport-related concussion. <i>Journal of Athletic Training</i> , 45(5), 492 – 498.
<b>Research Design /Level of Evidence</b>	Level VII evidence – Expert opinion.	Level VII evidence – Expert opinion.	Level VII evidence – Expert opinion.	Level VII evidence – Expert opinion.
<b>Article/ Study Purpose</b>	To address the importance of properly timing school re-entry after concussion.	To promote a community-based approach to pediatric concussion management.	To discuss the return to learn process and the role of school personnel in the implementation of this process.	To provide a framework for school athletic trainers to use in advising colleagues about the academic needs of students presenting with concussion.
<b>Sample Population</b>	N/A.	N/A.	N/A.	N/A.
<b>Method</b>	N/A.	N/A.	N/A.	N/A.
<b>Findings</b>	After the diagnosis of concussion, the first step in any concussion management plan is the initiation of physical and cognitive rest. The implementation of a gradual return to learn protocol should begin as	Newer recommendations are that children and teens should be treated much more conservatively than adults when it comes to a head injury. Care for the pediatric patient with concussion must be individualized, as each	Physical and cognitive rest are the best interventions for healing brain cells. Students may return to school when symptoms are tolerable and manageable, as long as the school makes	Students typically recovery more quickly with rest from physical exertion/athletic activity and from the cognitive demands of academic work. Accommodations for students in recovery include: excused absences

	soon as the student sustains a concussion. The medical team should work in combination with the school team to ensure student recovery.	patient will experience different symptoms and a different severity of symptoms. The child should rest, especially for the first few days post-concussion and throughout the typical three week recovery period.	appropriate adjustments for the student. Due to the often quick resolution of a concussion, academic adjustments must be flexible and fluid.	from classes, rest periods during the school day, extension of assignment deadlines, postponement or staggering of tests, extended testing time, accommodation for light or noise sensitivity, use of a reader or recorded books for assignments and testing, use of a note taker or scribe, use of a small and quiet examination room, preferential classroom seating, and temporary assistance of a tutor.
<b>Limitations</b>	Article is based on expert opinion.	The articles referenced do not involve return to learn information, thus the return to learn information is based on expert opinion.	Article is based on expert opinion.	Article is based on expert opinion.
<b>Strengths</b>	Article is authored by authorities in this field of study.	The REAP Project is the culmination of a study funded by the Center for Disease Control from 2004 to 2007.	Article is written by the same author of the REAP project and could be consider an authority on this topic.	Article provides an extensive list of academic accommodations for students recovering from concussion.
<b>Implications</b>	A return to learn protocol should take a stepwise approach to returning a student to the academic environment with the initial step being the	Good concussion management goes beyond neurocognitive screening and the return to play decision. Good concussion management involves	To date, there are no agreed upon formulas for return to learning. This is due largely to the fact that the return to school following concussion is	Academic accommodations for postconcussion symptoms may assist the student in obtaining an optimum balance between rest and

implementation of physical and cognitive rest.	exceptional communication and collaboration among a school team, a family team and the medical team.	an extremely individualized process and there is a lack of current research.	academic progress during concussion recovery.
--	--	--	---

<b>APA Citation</b>	Moser, R. S., Glatts, C., & Schatz, P. (2012). Efficacy of immediate and delayed cognitive and physical rest for treatment of sports-related concussion. <i>The Journal of Pediatrics</i> , 161(5), 922 – 926.	Oregon Concussion and Management Program. (2011). <i>Concussion management – Policy and resource handbook</i> . Retrieved from www.orcasinc.com.	Popoli, D. M., Burns, T. G., Meehan III, W. P., & Resiner, A. (2014). CHOA concussion consensus: Establishing a uniform policy for academic accommodations. <i>Clinical Pediatrics</i> , 53(3), 217 – 224.	Purcell, L. K. (2014). Sport-related concussion: Evaluation and management. <i>Paediatrics &amp; Child Health</i> , 19(3), 153 – 165.
<b>Research Design /Level of Evidence</b>	Level III evidence – Pretest-posttest design.	Level VII evidence – Practice guideline.	Level VII evidence – Expert opinion.	Level VII evidence – Practice guideline.
<b>Article/ Study Purpose</b>	To evaluate the efficacy of cognitive and physical rest for the treatment of concussion.	To provide effective concussion management for administration, the family team, the athletic team, the academic team, and the medical team.	(1) To promote a more uniform process of care for academic accommodations. (2) To provide recommendations addressing a uniform policy for pediatric concussion patients in academic institutions.	Reflects the latest recommendations and updates for managing pediatric concussions to better assist health care professionals in caring for injured children and adolescents ages five to eighteen.
<b>Sample Population</b>	Forty-nine high school to college-aged individuals referred to the Sports Concussion Center of New Jersey for assessment and management between April 2010 and September 2011.	N/A.	N/A.	N/A.

<b>Method</b>	Participants were assigned one week of cognitive rest. Participants were assigned to independent groups on the basis of the length of time between sustaining their concussion and their first post-concussion assessment. Patients were tested using ImPACT until the results were at or above baselines or until the results had stabilized with no further improvement in scores and with a patient report of no symptoms.	N/A.	N/A.	N/A.
<b>Findings</b>	Participants showed significantly improved performance on IMPACT testing and decreased symptom reporting following prescribed cognitive and physical rest ( $P < .001$ ), regardless of the time between concussion and onset of rest ( $P = .44$ ).	Symptoms of concussion will often create learning difficulties for students. Learning accommodations should be initiated immediately after diagnosis with a gradual return to full academics as symptoms clear.	Early referral to a concussion specialist during the acute window can expedite the implementation of the following tools: time off if needed, a student support team meeting, and a temporary letter of academic accommodation pending the need for more formal arrangements such as a 504 plan or an individualized educational program.	Consensus agreement is that rest, both physical and cognitive, is the most important aspect of concussion management. Cognitive rest involves limiting activities that require mental exertion. As symptoms improve, students can gradually increase cognitive tasks and social activities



<b>Limitations</b>	<p>Study is retrospective and lacking blinding, randomization, and comparison with a control group. Prescribed rest needs to be more accurately defined to proceed with future research. Compliance with prescribed rest was not specifically monitored or documented. Small, selective, convenience sample. Utilizes college age participants as well.</p>	<p>Adapted from the Oregon Concussion and Management Program and does not list references. Does not list the age group that the guideline can be applied to.</p>	<p>Article is based on expert opinion.</p>	<p>provided that symptoms are not exacerbated. Based on current data and expert opinion.</p>
<b>Strengths</b>	<p>Level III evidence.</p>	<p>Provides guidelines for administration, the family team, the athletic team, the academic team, and the medical team.</p>	<p>Article offers an outline of available academic accommodations options and an algorithm that can be used to streamline decision-making about academic accommodations.</p>	<p>Position statement from the Canadian Paediatric Society.</p>
<b>Implications</b>	<p>These preliminary data suggest that a period of cognitive and physical rest may be a useful means of treating concussion-related symptoms, whether applied soon after a concussion or weeks to months later.</p>	<p>Members of all of the following teams should be involved in pediatric concussion management: administration, the family team, the athletic team, the academic team, and the medical team.</p>	<p>There are no standard guidelines regarding academic accommodations and school policies regarding academic accommodations vary widely.</p>	<p>Concussion knowledge is continually evolving and health care professionals are encouraged to manage children and adolescents</p>

with sport-related  
concussions  
conservatively.

<b>APA Citation</b>	Rieger, B. (2012). Suggestions for facilitating return to learn after concussion. <i>Brain Injury Professional</i> , 9(1), 22 – 24.	Sady, M. D., Vaughan, C. G., & Gioia, G. A. (2011). School and the concussed youth – recommendations for concussion education and management. <i>Physical Medicine and Rehabilitation Clinics of North America</i> , 22(4), 701 – 719.	Zemek, R., Duval, S., Dematteo, C., Solomon, B., Keightley, M., & Osmond, M. (2014). <i>Guidelines for diagnosing and managing pediatric concussion</i> . Toronto, ON: Ontario Neurotrauma Foundation.
<b>Research Design /Level of Evidence</b>	Level VII evidence – Expert opinion.	Level VII evidence – Expert opinion.	Level VII evidence – Practice guideline.
<b>Article/ Study Purpose</b>	To educate health care professionals on return to school after concussion.	To provide a foundation for the post-injury management of cognitive activity, particularly in the school setting, to include the design and implementation of school-wide concussion education and management programs.	To develop high quality, evidence-based recommendations that: standardize the diagnosis and management of pediatric concussion; are relevant and useful for health care professionals; improve the care of children/adolescents who have sustained a concussion; reduce the impact of concussion on the mental health, social engagement and academic participation of children/adolescents during their formative years; and identify knowledge gaps in the literature that require

			more research.
<b>Sample Population</b>	N/A.	N/A.	N/A.
<b>Method</b>	N/A.	N/A.	Utilized the Practice Guidelines Evaluation and Adaptation Cycle as the model for developing the guidelines and the Glaser method of reaching consensus. Recommendations were created using the Appraisal of Guidelines for Research & Evaluation Instrument tool as a foundation for content.
<b>Findings</b>	Academic demands and expectations should be reduced to level that is manageable for the student and allows for rest. Limit the aggravation of symptoms due to environmental stimulation. Provide individualized academic accommodations based on the student’s symptoms.	Using a concussed brain to learn can worsen concussion symptoms and prolong recovery. The therapeutic goal during concussion recovery is to find an appropriate level of cognitive exertion that does not exacerbate symptoms or cause the reemergence of previously resolved symptoms. A careful balance between cognitive activity and rest is essential in the early stages of recovery and beyond. A school with concussion policies and procedures	Recommends the prescription of physical and cognitive rest and that the child/adolescent follow a stepwise return to learn plan after acute symptoms have improved. Implement a return to play program only after the child/adolescent has started their return to learn program. Work with the child/adolescent’s primary care professional and school regarding accommodations needed to success reenter the academic environment.

---

		implemented prior to a student sustaining an injury will be better prepared to manage a successful return.	
<b>Limitations</b>	Information in the article is based on clinical experience and the pathophysiology of concussion.	Article is based on expert opinion.	These guidelines do not apply to children under 5 years. There are no validated tools for this age group. Used a broader system to rank evidence that also emphasizes the strength of systematic reviews or large studies that may not involve interventions. Makes broad recommendations and then refers to tools that have already been developed.
<b>Strengths</b>	Expertise of the author of the article.	Article is well researched and includes many of the articles in this table. Includes a table listing accommodations for post-concussion effects affecting school and a table for implementing a return to learn protocol for a school district.	The target population is children between the ages of five to eighteen years who have sustained a concussion in the previous month. External reviewers were chosen for their expertise in relevant areas of pediatrics and their role as stakeholders in improving care and management of pediatric concussion. Extensive list of tools that can be used to manage

---

---

<b>Implications</b>	There is little research to guide health care providers in the optimal management of return to learn.	Whether or not protocols for return to academics are mandated by legislation, to support the recovery and academic needs of the recovering student, systematic efforts must be initiated as soon as possible.	pediatric concussion. The field of pediatric concussion is still in its infancy compared to that of general traumatic brain injury. Few randomized clinical trials have examined the results of possible therapies. In particular, the ideal duration of physical and cognitive rest remains unknown. There is a clear and urgent need to develop guidelines to diagnose and manage pediatric concussion.
---------------------	---	---	--

Appendix B  
Academic Accommodations According to Symptom

Table format adapted from Davis & Purcell, 2014.

<b>Symptom</b>	<b>Effect(s) on school attendance</b>	<b>Academic Accommodations</b>
<b>Anxiety</b>	<ul style="list-style-type: none"> <li>▪ Interferes with attention and concentration (Gioia, 2014; Purcell, 2014; Sady, et al., 2011).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Academic workload reduction (Colorado Department of Education, 2014; Gioia, 2014; McAvoy, 2012; Purcell, 2014; Sady, et al., 2011).</li> <li>▪ Allow student to designate a supportive adult (e.g. counselor, registered nurse, teacher) to visit with when symptomatic (Colorado Department of Education, 2014).</li> <li>▪ Alternative forms of testing (e.g. quiet testing, one-on-one testing, oral testing) (Colorado Department of Education, 2014; Gioia, 2014; McAvoy, 2012; Sady, et al., 2011).</li> <li>▪ Frequent rest breaks (Defense and Veterans Brain Injury Center, 2014).</li> <li>▪ Reassurance from teachers and other support personnel about the reason for and possible duration of the academic accommodations (Gioia, 2014; Purcell, 2014).</li> <li>▪ Rotation of classes attended, if the student is not attending school full-time, so they can attend each subject a couple of times per week (Sady, et al., 2011).</li> </ul>
<b>Attention/concentration, decreased</b>	<ul style="list-style-type: none"> <li>▪ Limits focus on lectures, classwork, and homework (Gioia, 2014; Purcell, 2014; Sady, et al., 2011).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Academic workload reduction (Baker et al., 2014; Davis &amp; Purcell, 2014; Gioia, 2014; McAvoy, 2012; Purcell, 2014; Sady, et al., 2011).</li> <li>▪ Extend completion time frames for assignments (Colorado Department of Education, 2014; Davis &amp; Purcell, 2014; Defense and Veterans Brain Injury Center, 2014; McAvoy, 2012; Oregon Concussion and Management Program, 2011; Purcell, 2014; Zemek et al., 2014).</li> <li>▪ Frequent rest breaks (Colorado Department of Education, 2014; Davis &amp; Purcell, 2014; Purcell, 2014).</li> </ul>

Symptom	Effect(s) on school attendance	Academic Accommodations
<b>Depression</b>	<ul style="list-style-type: none"> <li>▪ Withdrawal from school (Gioia, 2014; Sady, et al., 2011).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Limited, modified, or no testing during concussion recovery (Baker et al., 2014; Oregon Concussion and Management Program, 2011; Sady, et al., 2011).</li> <li>▪ Preferential classroom seating (i.e. away from windows, front of the room) to minimize distraction (DeMatteo et al., 2015; McGrath, 2010; Oregon Concussion and Management Program, 2011; Popoli et al., 2014; Reiger, 2012).</li> <li>▪ Provide assistance with organizing and prioritizing assignments, quizzes, and tests and setting academic priorities (McGrath, 2010; Popoli et al., 2014).</li> <li>▪ Shortened assignments (Gioia, 2014; Purcell, 2014; Sady, et al., 2011).</li> <li>▪ Temporary assistance of a note taker (Colorado Department of Education, 2014; McGrath, 2010; McAvoy, 2012; Popoli et al., 2014).</li> <li>▪ Temporary assistance of a tutor (Master et al., 2012; McGrath, 2010; Oregon Concussion and Management Program, 2011; Popoli et al., 2014; Reiger, 2012).</li> <li>▪ Use of preprinted class notes and/ or lecture outlines (Master et al., 2012; Sady, et al., 2011).</li> <li>▪ Use of a reader or recorded books for assignments and testing (McGrath, 2010; Popoli et al., 2014).</li> <li>▪ Use of a tape recorder to record lectures (Oregon Concussion and Management Program, 2011).</li> <li>▪ Use of a small quiet, examination room for assignment completion and testing (McGrath, 2010; Oregon Concussion and Management Program, 2011; Popoli et al., 2014; Purcell, 2014; Reiger, 2012).</li> <li>▪ Allow student to designate a supportive adult (e.g. counselor, registered nurse, teacher) to visit with when symptomatic (Colorado Department of Education, 2014).</li> <li>▪ Build time into the student’s schedule to socialize with friends</li> </ul>



Symptom	Effect(s) on school attendance	Academic Accommodations
<b>Dizziness/ Balance Difficulties</b>	<ul style="list-style-type: none"> <li>▪ Unsteadiness while transitioning between classes (Gioia, 2014; Sady, et al., 2011).</li> </ul>	<p>(Gioia, 2014; Sady, et al., 2011).</p> <ul style="list-style-type: none"> <li>▪ Allow extra time to travel between classes (Halstead et al., 2013).</li> <li>▪ Allow for class transition prior to or after the bell to avoid possible injury in crowded hallways (Colorado Department of Education, 2014; Gioia, 2014; Halstead et al., 2013; Oregon Concussion and Management Program, 2011; Sady, et al., 2011).</li> <li>▪ Allow student to put their head down on their desk if symptoms worsen during class (Halstead et al., 2013).</li> </ul>
<b>Fatigue, cognitive</b>	<ul style="list-style-type: none"> <li>▪ Decreases ability to engage in basic attention and working memory task (Gioia, 2014; Sady, et al., 2011).</li> <li>▪ Decreases attention span and difficulty concentrating (Davis &amp; Purcell, 2014).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Decrease the amount of in-class schoolwork and homework to minimize symptom exacerbations (Colorado Department of Education, 2014; McAvoy, 2012).</li> <li>▪ Participation in essential courses only (Davis &amp; Purcell, 2014; Purcell, 2014).</li> <li>▪ Part-time school attendance, if necessary based on the student's symptomology (Reiger, 2012).</li> <li>▪ Reduce academic workload to essential material only (Baker et al., 2014; Colorado Department of Education, 2014).</li> <li>▪ Rest breaks (i.e. fifteen to twenty minutes) during classes, homework, and exams, scheduled and as need, in a quiet, dimly lit area (Baker et al., 2014; Colorado Department of Education, 2014; Davis &amp; Purcell, 2014; McAvoy, 2012; Oregon Concussion and Management Program, 2011; Purcell, 2014; Sady, et al., 2011). <ul style="list-style-type: none"> <li>▪ Incorporate at least one scheduled fifteen to twenty minute rest break into the student's morning and afternoon schedule (McAvoy, 2009).</li> </ul> </li> <li>▪ Shorten academic day with late start or early dismissal based on the student's peak time of day (Davis &amp; Purcell, 2014; McAvoy, 2012; Purcell, 2014).</li> </ul>
<b>Headache</b>	<ul style="list-style-type: none"> <li>▪ Difficulty concentrating (Davis &amp; Purcell, 2014; Gioia, 2014; Sady, et al., 2011).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Hydration (Purcell, 2014).</li> <li>▪ Identify circumstances that cause and/or aggravate headaches and reduce exposure to them (e.g. fluorescent lighting, loud noises,</li> </ul>

Symptom	Effect(s) on school attendance	Academic Accommodations
	<ul style="list-style-type: none"> <li>▪ Increases irritability (Gioia, 2014).</li> </ul>	<ul style="list-style-type: none"> <li>concentrating on tasks) (Halstead et al., 2013).</li> <li>▪ Rest breaks (i.e. fifteen to twenty minutes) during classes, homework, and exams, scheduled and as need, in a quiet dimly lit area (Davis &amp; Purcell, 2014; Gioia, 2014; Halstead et al., 2013; Master et al., 2012; McAvoy, 2012; Purcell, 2014; Reiger, 2012; Sady, et al., 2011).</li> <li>▪ Short naps (Gioia, 2014).</li> </ul>
<b>Information processing speed, reduced</b>	<ul style="list-style-type: none"> <li>▪ Decreases ability to keep up with work demand (Gioia, 2014; Sady, et al., 2011).</li> <li>▪ Decreases ability to process verbal information efficiently (Gioia, 2014; Sady, et al., 2011).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Eliminate nonessential assignments or tests (Colorado Department of Education, 2014; Master et al., 2012; McAvoy, 2009; McAvoy, 2012; Oregon Concussion and Management Program, 2011; Reiger, 2012).</li> <li>▪ Extend assignment deadlines (Colorado Department of Education, 2014; McAvoy, 2012; Popoli et al., 2014).</li> <li>▪ Extra time for the completion of in-class and homework assignments (McAvoy, 2009; McAvoy, 2012; McGrath, 2010; Oregon Concussion and Management Program, 2011; Sady, et al., 2011).</li> <li>▪ Extra time for test taking (McAvoy, 2009; McAvoy, 2012; McGrath, 2010; Oregon Concussion and Management Program, 2011; Popoli et al., 2014; Sady, et al., 2011).</li> <li>▪ Extra time for test taking in a quiet environment (Oregon Concussion and Management Program, 2011).</li> <li>▪ Reduce the amount of homework assigned (Baker et al., 2014; Colorado Department of Education, 2014; McAvoy, 2012; Reiger, 2012).</li> <li>▪ Use of preprinted class notes/lecture outlines (Master, 2012; McAvoy, 2009; McAvoy, 2012; Oregon Concussion and Management Program, 2011; Sady, et al., 2011).</li> </ul>
<b>Irritability</b>	<ul style="list-style-type: none"> <li>▪ Decreases tolerance for stress (Gioia, 2014).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Allow student to designate a supportive adult (e.g. counselor, registered nurse, teacher) to visit with when symptomatic (Colorado Department of Education, 2014; Oregon Concussion and Management Program, 2011).</li> </ul>

Symptom	Effect(s) on school attendance	Academic Accommodations
<b>Memory, impaired</b>	<ul style="list-style-type: none"> <li>▪ Decreases ability to complete reading comprehension, math calculations, and writing assignments (Gioia, 2014; Sady, et al., 2011).</li> <li>▪ Difficulty accessing and applying previously learned information (Gioia, 2014; Halstead, 2013; Purcell, 2014; Sady, et al., 2011).</li> <li>▪ Difficulty learning new tasks and comprehending new materials (Halstead, 2013).</li> <li>▪ Difficulty or inability to recall instructions (Gioia, 2014; Purcell, 2014; Sady, et al., 2011).</li> <li>▪ Difficulty or inability retaining new information (Gioia, 2014; Purcell, 2014; Sady, et al., 2011).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Allow student to remove himself or herself from the classroom as needed to deescalate (Colorado Department of Education, 2014; McAvoy, 2012).</li> <li>▪ Frequent rest breaks (Gioia, 2014).</li> <li>▪ Identify stimulation and stressors in order to reduce them (Gioia, 2014).</li> <li>▪ Avoid or postpone test taking or completion of major projects (Colorado Department of Education, 2014; Halstead et al., 2013; McAvoy, 2012; Popoli et al., 2014). <ul style="list-style-type: none"> <li>▪ Once the student can tolerate a full day of school, consider untimed testing (Master et al., 2012).</li> </ul> </li> <li>▪ Decrease academic workload with smaller amounts to learn (Colorado Department of Education, 2014; Gioia, 2014; McAvoy, 2012, Purcell, 2014; Sady, et al., 2011).</li> <li>▪ Extend time frames for completion of work (Colorado Department of Education, 2014; Gioia, 2014; Halstead et al., 2013, Master et al., 2012; Oregon Concussion and Management Program, 2011).</li> <li>▪ Provide written instructions for assignments and tasks (Colorado Department of Education, 2014; Gioia, 2014; Oregon Concussion and Management Program, 2011; Reiger, 2012; Sady, et al., 2011).</li> <li>▪ Repeat instructions and information to be learned as needed (Gioia, 2014; Purcell, 2014; Sady, et al., 2011).</li> <li>▪ Use of auditory versions of books (Reiger, 2012).</li> <li>▪ Use of preprinted notes (Halstead et al., 2013; Oregon Concussion and Management Program, 2011; Purcell, 2014; Reiger, 2012; Sady, et al., 2011).</li> <li>▪ Use of a notetaker or scribe (Colorado Department of Education, 2014; Halstead et al., 2013; McAvoy, 2012; Sady, et al., 2011).</li> <li>▪ Utilize alternative test formats such as open-book or multiple-</li> </ul>

Symptom	Effect(s) on school attendance	Academic Accommodations
		choice exams (Reiger, 2012).
<b>Phonophobia</b>	<ul style="list-style-type: none"> <li>▪ Difficulty concentrating (Davis &amp; Purcell, 2014).</li> <li>▪ Worsening of headaches, if present (Purcell, 2014).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Avoid music classes, physical education classes, and shop classes (Colorado Department of Education, 2014; Defense and Veterans Brain Injury Center, 2014; Halstead et al., 2013; Oregon Concussion and Management Program, 2011).</li> <li>▪ Avoid or limit access to noisy areas or crowded environments (e.g. assemblies, cafeteria, dances, gym, hallways, sports games) (Baker et al., 2014; Davis &amp; Purcell, 2014; Gioia, 2011; Gioia, 2014; Halstead et al., 2013; McAvoy, 2009; McAvoy, 2012; Reiger, 2012; Sady, et al., 2011).                             <ul style="list-style-type: none"> <li>▪ Allow for class transition prior to or after the bell (Halstead et al., 2013; Reiger, 2012; Sady, et al., 2011).</li> <li>▪ Allow extra time to travel between classes (Halstead et al., 2013).</li> <li>▪ Eat lunch in a quiet area with one or two friends (Halstead et al., 2013; McGrath, 2010; Oregon Concussion and Management Program, 2011; Reiger, 2012; Sady, et al., 2011).</li> </ul> </li> <li>▪ Use of earphones or earplugs (DeMatteo et al., 2015; Halstead et al., 2013; McAvoy, 2012).</li> </ul>
<b>Photophobia</b>	<ul style="list-style-type: none"> <li>▪ Difficulty concentrating (Davis &amp; Purcell, 2014).</li> <li>▪ Difficulty concentrating on visual tasks (Halstead et al., 2013).</li> <li>▪ Difficulty reading (Halstead et al., 2013).</li> <li>▪ Worsening of headaches, if present (Purcell, 2014).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Avoid exposure to fluorescent lighting as much as possible (Popoli et al., 2014).</li> <li>▪ Avoid or limit access to noisy areas or crowded environments (e.g. assemblies, cafeteria, dances, gym, hallways, sports games) (Baker et al., 2014; Davis &amp; Purcell, 2014; Gioia, 2011; Gioia, 2014; Halstead et al., 2013; McAvoy, 2009; McAvoy, 2012; Reiger, 2012; Sady, et al., 2011).                             <ul style="list-style-type: none"> <li>▪ Allow for class transition prior to or after the bell (Halstead et al., 2013; Reiger, 2012; Sady, et al., 2011).</li> <li>▪ Allow extra time to travel between classes (Halstead et al.,</li> </ul> </li> </ul>

Symptom	Effect(s) on school attendance	Academic Accommodations
		<p>2013).</p> <ul style="list-style-type: none"> <li>▪ Eat lunch in a quiet area with one or two friends (Halstead et al., 2013; McGrath, 2010; Oregon Concussion and Management Program, 2011; Reiger, 2012; Sady, Vaughan, &amp; Gioia, 2011).</li> <li>▪ Limit exposure to computers/tablets, slide presentations, smart boards, and videos (Halstead et al., 2013).</li> <li>▪ Limit screen time (e.g. computers, television, cell phones) (Davis &amp; Purcell, 2014).</li> <li>▪ Preferential seating away from bright sunlight or other bothersome light (Gioia, 2014; Oregon Concussion and Management Program, 2011; Sady, et al., 2011).</li> <li>▪ Reduce the brightness of cell phones, computers, and tablet screens (Halstead et al., 2013).</li> <li>▪ Use of a note taker or scribe (Popoli et al., 2014).</li> <li>▪ Use of a reader or recorded books for assignments and testing (Popoli et al., 2014).</li> <li>▪ Wear dark glasses/sunglasses in the classroom (Colorado Department of Education, 2014; Defense and Veterans Brain Injury Center, 2014; DeMatteo et al., 2015; Gioia, 2014; Halstead et al., 2013; McAvoy, 2012; McGrath, 2010; Oregon Concussion and Management Program, 2011; Reiger, 2012; Sady, et al., 2011).</li> <li>▪ Wear a hat with a visor in the classroom (Halstead et al., 2013; McGrath, 2010; Oregon Concussion and Management Program, 2011; Reiger, 2012).</li> </ul>
<p><b>Sleep disturbances</b></p>	<ul style="list-style-type: none"> <li>▪ Decreased ability to attend classes and focus (Halstead, 2013; Sady, et al., 2011).</li> <li>▪ Decreased memory for new or previous learning (Halstead, 2013).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Frequent rest breaks (Colorado Department of Education, 2014; Halstead et al., 2013; McAvoy, 2012).</li> <li>▪ Later school start time (Colorado Department of Education, 2014; Gioia, 2014; Halstead et al., 2013, McAvoy, 2012; McGrath, 2010; Sady, et al., 2011).</li> <li>▪ Shortened school day (Baker et al., 2014; Colorado Department of Education, 2014; Gioia, 2014; Halstead et al., 2013; McAvoy,</li> </ul>

<b>Symptom</b>	<b>Effect(s) on school attendance</b>	<b>Academic Accommodations</b>
	<ul style="list-style-type: none"><li data-bbox="556 228 968 342">▪ Sleeping in class (Halstead, 2013; Sady, et al., 2011).</li><li data-bbox="556 342 968 454">▪ Tardiness or excessive absences from school. (Halstead, 2013).</li></ul>	2012; McGrath, 2010; Oregon Concussion and Management Program, 2011; Sady, et al., 2011).

Appendix C  
Return to Learn Protocol

	<b>Description of Step</b>	<b>Academic Environment Accommodations</b>	<b>Conditions to Be Met Prior to Moving to the Next Step</b>
<b>Step 1 – Student Should Remain Home from School</b>	<ul style="list-style-type: none"> <li>▪ Student should remain home from school and practice physical and cognitive rest (Baker et al., 2014; Colorado Department of Education, 2014; Davis &amp; Purcell, 2014; Gioia, 2014; Grady, et al., 2012).</li> <li>▪ The amount of cognitive rest necessary depends on the symptomology of the individual student (Baker et al., 2014; Grady, et al., 2012).</li> <li>▪ If concussion symptoms prevent the student from concentrating on cognitive activity for up to ten minutes at a time, complete cognitive rest is recommended (Colorado Department of Education, 2014; McAvoy, 2012).</li> <li>▪ If the student is able to concentrate on cognitive activity for up to twenty minutes at a time without symptom exacerbation, complete cognitive rest may not be necessary (McAvoy, 2012).</li> <li>▪ The student should stay home</li> </ul>	<ul style="list-style-type: none"> <li>▪ Initial avoidance of activities that require prolonged concentration for at least the first day post-concussion such as computer use, driving, homework, playing a musical instrument, reading, texting, or video games (Baker et al., 2014; Colorado Department of Education, 2014; Defense and Veterans Brain Injury Center, 2014; Grady, 2010; Halstead et al., 2013; Master et al., 2012; Oregon Concussion and Management Program, 2011).</li> <li>▪ Limited cognitive tasks and screen time can be considered if the student can tolerate over ten minutes of the activity without symptom exacerbation such as drawing, engaging in a light conversation, light reading, light walking, playing with Legos or cars, watching a limited amount of television, or playing a simple board game (Baker et al., 2014; Colorado Department of</li> </ul>	<ul style="list-style-type: none"> <li>▪ Student must be able to sustain concentration for thirty minutes before significant concussion symptom exacerbation (Gioia, 2014; Grady et al., 2012).</li> <li>▪ Symptoms are mild or resolve with cognitive rest breaks (Gioia, 2014; Grady, 2010).</li> <li>▪ If concussion symptoms persist past two weeks, advance the student to Step 2 in order to prevent depression and anxiety (DeMatteo et al., 2015).</li> <li>▪ If the student’s concussion symptoms are severe (i.e. cannot concentrate for more than ten minutes) and/or persist for more than ten days, return to medical provider for evaluation (Baker et al., 2014; Colorado Department of Education, 2014; McAvoy, 2012).</li> <li>▪ Parents should contact the school district to arrange for a graduated return to school with accommodations (Baker et al., 2014).</li> <li>▪ Student athlete should have a neurocognitive evaluation</li> </ul>

Description of Step	Academic Environment Accommodations	Conditions to Be Met Prior to Moving to the Next Step
	<p>from school for a minimum of one to three days (Baker et al., 2014; Defense and Veterans Brain Injury Center, 2014; Grady et al., 2012; McAvoy, 2009; McGrath, 2010; Popoli et al., 2014; Zemek et al., 2014).</p>	<p>(ImPACT) within the first days of the injury, preferably within twenty-four hours (McGrath, 2010).</p> <ul style="list-style-type: none"> <li>▪ Periodic neurocognitive retesting should also occur at days three, five, and seven postinjury, or until the student reaches their baseline testing score (McGrath, 2010, Piebes et al., 2009).</li> </ul>
<p><b>Step 2 – Preparing to Return to School</b></p>	<ul style="list-style-type: none"> <li>▪ Begin a gradual reintroduction of cognitive activity at home while remaining below the student’s symptom threshold (Baker et al., 2014; Master et al., 2012).</li> </ul>	<ul style="list-style-type: none"> <li>▪ As the student’s symptoms improve, cognitive activity may be slowly increased at home in five to fifteen minute increments as tolerated (Master et al., 2012; Purcell, 2014; Sady, et al., 2011).</li> <li>▪ The ultimate goal of this gradual increase in cognitive activity is to build up to thirty to forty-five minutes of cognitive activity without symptom exacerbation or emergence of symptoms (Baker et al., 2014; Gioia, 2014; Sady, et al., 2011).</li> <li>▪ These cognitive activities may include light reading, math assignments, or other homework assignments in short intervals in a quiet</li> </ul>



Description of Step	Academic Environment Accommodations	Conditions to Be Met Prior to Moving to the Next Step
<p><b>Step 3 – Return to School with Maximum Academic Accommodations</b></p>	<p>environment (Grady, 2010).</p> <ul style="list-style-type: none"> <li>▪ If any of these cognitive activities cause a worsening of symptoms, the length of the activity should be reduced to the prior level (DeMatteo et al., 2015; Gioia, 2014).</li> <li>▪ Implement academic accommodations based on the individual student’s needs for controlled subsymptom threshold increase in cognitive activities (Baker et al., 2014; Master et al., 2012).</li> <li>▪ When possible increase academic adjustments as opposed to decreasing time at school (McAvoy, 2012; Oregon Concussion and Management Program, 2011).</li> <li>▪ Start out with hourly school attendance with the most severely symptomatic students, to half days, or two full days combined with half days (Davis &amp; Purcell, 2014; DeMatteo et al., 2015; Grady, et al., 2012).</li> <li>▪ Priority attendance at designated core classes may also be implemented</li> </ul>	<ul style="list-style-type: none"> <li>▪ The student may proceed to step 4 when the number and severity of their symptoms are decreasing (Gioia, 2014) AND</li> <li>▪ When they only require one to two thirty minute cognitive rest periods built into the school day (Gioia, 2014) AND</li> <li>▪ When the student can tolerate one to three classes daily (Gioia, 2014).</li> <li>▪ This step may last for months depending on the individual student (DeMatteo et al., 2015).</li> <li>▪ If this step lasts longer than four weeks an individualized education plan (IEP) or 504 plan may need to be formalized (DeMatteo et al., 2015).</li> </ul>

Description of Step	Academic Environment Accommodations	Conditions to Be Met Prior to Moving to the Next Step
	<p>(McGrath, 2010; Purcell, 2014).</p> <ul style="list-style-type: none"> <li>▪ No assigned homework initially (DeMatteo, 2015; Purcell, 2014).</li> <li>▪ Gradually begin assigning homework in fifteen minute blocks up to forty-five minutes daily depending on the student’s symptom threshold (DeMatteo, 2015; Purcell, 2014).</li> <li>▪ No quizzes, tests, or exams should be administered during this step (Gioia, 2014; McGrath, 2010; Oregon Concussion and Management Program, 2011).</li> </ul>	
<p><b>Step 4 – Return to School with Minimal Academic Accommodations and Near Normal Academic Routine</b></p>	<ul style="list-style-type: none"> <li>▪ Full time school attendance with minimal academic accommodations (Baker et al., 2014; Gioia, 2014; Oregon Concussion and Management Program, 2011).</li> <li>▪ Attendance of all classes with zero to one cognitive rest breaks (Gioia, 2014).</li> <li>▪ Attend full days of school, but less than five days a week if necessary (DeMatteo et al., 2015).</li> <li>▪ Begin modified test taking with a maximum of one test per week (DeMatteo et al., 2015; Gioia, 2014; Oregon Concussion and Management Program, 2011; Purcell, 2014;</li> </ul>	<ul style="list-style-type: none"> <li>▪ The student may proceed to step 5 when they have no active concussion symptoms (Gioia, 2014) AND</li> <li>▪ The student experiences no exertional effects of cognitive activity during the entire full school day (Gioia, 2014).</li> </ul>

Description of Step	Academic Environment	Accommodations	Conditions to Be Met Prior to Moving to the Next Step
		<p>Sady, et al., 2011).</p> <ul style="list-style-type: none"> <li>▪ Homework of sixty to ninety minutes per night with moderate to maximum expectations for productivity (Gioia, 2014).</li> </ul>	
<p><b>Step 5 – Full Return to School</b></p>	<ul style="list-style-type: none"> <li>▪ Full time school attendance (i.e. five days a week) with no academic accommodations (Oregon Concussion and Management Program, 2011).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Attend all classes with no cognitive breaks throughout the day (DeMatteo et al., 2015; Gioia, 2014).</li> <li>▪ Maximum expectations for academic productivity to pre-injury levels (DeMatteo, 2015; Gioia, 2014).</li> <li>▪ Full homework and testing (Oregon Concussion and Management Program, 2011).</li> <li>▪ Begin to address makeup work if necessary (Gioia, 2014).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Implement a return to play protocol once the student is symptom free and back to full-time school attendance without academic accommodations (Purcell, 2014).</li> </ul>

## Appendix D Sport Concussion Assessment Tool (SCAT3) – 3<sup>rd</sup> Edition

Downloaded from [bjsm.bmj.com](http://bjsm.bmj.com) on March 12, 2013 - Published by [group.bmj.com](http://group.bmj.com)

# SCAT3™

## Sport Concussion Assessment Tool – 3rd Edition

For use by medical professionals only



Name \_\_\_\_\_ Date/Time of Injury: \_\_\_\_\_ Examiner: \_\_\_\_\_  
Date of Assessment: \_\_\_\_\_

### What is the SCAT3?¹

The SCAT3 is a standardized tool for evaluating injured athletes for concussion and can be used in athletes aged from 13 years and older. It supersedes the original SCAT and the SCAT2 published in 2005 and 2009, respectively². For younger persons, ages 12 and under, please use the Child SCAT3. The SCAT3 is designed for use by medical professionals. If you are not qualified, please use the Sport Concussion Recognition Tool³. Preseason baseline testing with the SCAT3 can be helpful for interpreting post-injury test scores.

Specific instructions for use of the SCAT3 are provided on page 3. If you are not familiar with the SCAT3, please read through these instructions carefully. This tool may be freely copied in its current form for distribution to individuals, teams, groups and organizations. Any revision or any reproduction in a digital form requires approval by the Concussion in Sport Group.

**NOTE:** The diagnosis of a concussion is a clinical judgment, ideally made by a medical professional. The SCAT3 should not be used solely to make, or exclude, the diagnosis of concussion in the absence of clinical judgement. An athlete may have a concussion even if their SCAT3 is "normal".

### What is a concussion?

A concussion is a disturbance in brain function caused by a direct or indirect force to the head. It results in a variety of non-specific signs and/or symptoms (some examples listed below) and most often does not involve loss of consciousness. Concussion should be suspected in the presence of **any one or more** of the following:

- Symptoms (e.g., headache), or
- Physical signs (e.g., unsteadiness), or
- Impaired brain function (e.g. confusion) or
- Abnormal behaviour (e.g., change in personality).

## SIDELINE ASSESSMENT

### Indications for Emergency Management

**NOTE:** A hit to the head can sometimes be associated with a more serious brain injury. Any of the following warrants consideration of activating emergency procedures and urgent transportation to the nearest hospital:

- Glasgow Coma score less than 15
- Deteriorating mental status
- Potential spinal injury
- Progressive, worsening symptoms or new neurologic signs

### Potential signs of concussion?

If any of the following signs are observed after a direct or indirect blow to the head, the athlete should stop participation, be evaluated by a medical professional and **should not be permitted to return to sport the same day** if a concussion is suspected.

Any loss of consciousness?	<input type="checkbox"/> Y <input type="checkbox"/> N
"If so, how long?" _____	
Balance or motor incoordination (stumbles, slow/laboured movements, etc)?	<input type="checkbox"/> Y <input type="checkbox"/> N
Disorientation or confusion (inability to respond appropriately to questions)?	<input type="checkbox"/> Y <input type="checkbox"/> N
Loss of memory:	<input type="checkbox"/> Y <input type="checkbox"/> N
"If so, how long?" _____	
"Before or after the injury?" _____	
Blank or vacant look:	<input type="checkbox"/> Y <input type="checkbox"/> N
Visible facial injury in combination with any of the above:	<input type="checkbox"/> Y <input type="checkbox"/> N

## 1 Glasgow coma scale (GCS)

<b>Best eye response (E)</b>	
No eye opening	1
Eye opening in response to pain	2
Eye opening to speech	3
Eyes opening spontaneously	4
<b>Best verbal response (V)</b>	
No verbal response	1
Incomprehensible sounds	2
Inappropriate words	3
Confused	4
Oriented	5
<b>Best motor response (M)</b>	
No motor response	1
Extension to pain	2
Abnormal flexion to pain	3
Flexion/Withdrawal to pain	4
Localizes to pain	5
Obeys commands	6
<b>Glasgow Coma score (E + V + M)</b>	<b>of 15</b>

GCS should be recorded for all athletes in case of subsequent deterioration.

## 2 Maddocks Score³

*"I am going to ask you a few questions. please listen carefully and give your best effort."*  
Modified Maddocks questions (1 point for each correct answer)

What venue are we at today?	0	1
Which half is it now?	0	1
Who scored last in this match?	0	1
What team did you play last week/game?	0	1
Did your team win the last game?	0	1
<b>Maddocks score</b>	<b>of 5</b>	

Maddocks score is validated for sideline diagnosis of concussion only and is not used for serial testing.

**Notes:** Mechanism of Injury ("tell me what happened?"):

---



---



---



---

**Any athlete with a suspected concussion should be REMOVED FROM PLAY, medically assessed, monitored for deterioration (i.e., should not be left alone) and should not drive a motor vehicle until cleared to do so by a medical professional. No athlete diagnosed with concussion should be returned to sports participation on the day of injury.**

**BACKGROUND**

Name: \_\_\_\_\_ Date: \_\_\_\_\_  
 Examiner: \_\_\_\_\_  
 Sport/team/school: \_\_\_\_\_ Date/time of injury: \_\_\_\_\_  
 Age: \_\_\_\_\_ Gender:  M  F  
 Years of education completed: \_\_\_\_\_  
 Dominant hand:  right  left  neither  
 How many concussions do you think you have had in the past? \_\_\_\_\_  
 When was the most recent concussion? \_\_\_\_\_  
 How long was your recovery from the most recent concussion? \_\_\_\_\_  
 Have you ever been hospitalized or had medical imaging done for a head injury?  Y  N  
 Have you ever been diagnosed with headaches or migraines?  Y  N  
 Do you have a learning disability, dyslexia, ADD/ADHD?  Y  N  
 Have you ever been diagnosed with depression, anxiety or other psychiatric disorder?  Y  N  
 Has anyone in your family ever been diagnosed with any of these problems?  Y  N  
 Are you on any medications? If yes, please list:  Y  N

SCAT3 to be done in resting state. Best done 10 or more minutes post exercise.

**SYMPTOM EVALUATION**

**3 How do you feel?**  
*"You should score yourself on the following symptoms, based on how you feel now."*

	none	mild	moderate	severe			
Headache	0	1	2	3	4	5	6
"Pressure in head"	0	1	2	3	4	5	6
Neck Pain	0	1	2	3	4	5	6
Nausea or vomiting	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6
Blurred vision	0	1	2	3	4	5	6
Balance problems	0	1	2	3	4	5	6
Sensitivity to light	0	1	2	3	4	5	6
Sensitivity to noise	0	1	2	3	4	5	6
Feeling slowed down	0	1	2	3	4	5	6
Feeling like "in a fog"	0	1	2	3	4	5	6
"Don't feel right"	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6
Fatigue or low energy	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6
Trouble falling asleep	0	1	2	3	4	5	6
More emotional	0	1	2	3	4	5	6
Irritability	0	1	2	3	4	5	6
Sadness	0	1	2	3	4	5	6
Nervous or Anxious	0	1	2	3	4	5	6

**Total number of symptoms** (Maximum possible 22) \_\_\_\_\_  
**Symptom severity score** (Maximum possible 132) \_\_\_\_\_

Do the symptoms get worse with physical activity?  Y  N  
 Do the symptoms get worse with mental activity?  Y  N

self rated  self rated and clinician monitored  
 clinician interview  self rated with parent input

**Overall rating:** If you know the athlete well prior to the injury, how different is the athlete acting compared to his/her usual self?  
 Please circle one response:  no different  very different  unsure  N/A

Scoring on the SCAT3 should not be used as a stand-alone method to diagnose concussion, measure recovery or make decisions about an athlete's readiness to return to competition after concussion. Since signs and symptoms may evolve over time, it is important to consider repeat evaluation in the acute assessment of concussion.

**COGNITIVE & PHYSICAL EVALUATION**

**4 Cognitive assessment**  
**Standardized Assessment of Concussion (SAC)<sup>1</sup>**

**Orientation** (1 point for each correct answer)

What month is it?	0	1
What is the date today?	0	1
What is the day of the week?	0	1
What year is it?	0	1
What time is it right now? (within 1 hour)	0	1

**Orientation score** \_\_\_\_\_ of 5

**Immediate memory**

List	Trial 1	Trial 2	Trial 3	Alternative word list					
elbow	0	1	0	1	0	1	candle	baby	finger
apple	0	1	0	1	0	1	paper	monkey	penny
carpet	0	1	0	1	0	1	sugar	perfume	blanket
saddle	0	1	0	1	0	1	sandwich	sunset	lemon
bubble	0	1	0	1	0	1	wagon	iron	insect

**Total** \_\_\_\_\_

**Immediate memory score total** \_\_\_\_\_ of 15

**Concentration: Digits Backward**

List	Trial 1	Alternative digit list			
4-9-3	0	1	6-2-9	5-2-6	4-1-5
3-8-1-4	0	1	3-2-7-9	1-7-9-5	4-9-6-8
6-2-9-7-1	0	1	1-5-2-8-6	3-8-5-2-7	6-1-8-4-3
7-1-8-4-6-2	0	1	5-3-9-1-4-8	8-3-1-9-6-4	7-2-4-8-5-6

**Total of 4** \_\_\_\_\_

**Concentration: Month in Reverse Order** (1 pt. for entire sequence correct)  
 Dec-Nov-Oct-Sept-Aug-Jul-Jun-May-Apr-Mar-Feb-Jan  0  1

**Concentration score** \_\_\_\_\_ of 5

**5 Neck Examination:**  
 Range of motion \_\_\_\_\_ Tenderness \_\_\_\_\_ Upper and lower limb sensation & strength \_\_\_\_\_  
 Findings: \_\_\_\_\_

**6 Balance examination**  
 Do one or both of the following tests.  
 Footwear (shoes, barefoot, braces, tape, etc.) \_\_\_\_\_

**Modified Balance Error Scoring System (BESS) testing<sup>3</sup>**  
 Which foot was tested (i.e., which is the non-dominant foot)  Left  Right  
 Testing surface (hard floor, field, etc.) \_\_\_\_\_

**Condition**

Double leg stance:	Errors
Single leg stance (non-dominant foot):	Errors
Tandem stance (non-dominant foot at back):	Errors

**And/Or**

**Tandem gait<sup>4,7</sup>**  
 Time (best of 4 trials): \_\_\_\_\_ seconds

**7 Coordination examination**  
**Upper limb coordination**  
 Which arm was tested:  Left  Right  
**Coordination score** \_\_\_\_\_ of 1

**8 SAC Delayed Recall<sup>4</sup>**  
**Delayed recall score** \_\_\_\_\_ of 5

Downloaded from [bjsm.bmj.com](http://bjsm.bmj.com) on March 12, 2013 - Published by [group.bmj.com](http://group.bmj.com)

## INSTRUCTIONS

Words in *Italics* throughout the SCAT3 are the instructions given to the athlete by the tester.

### Symptom Scale

*"You should score yourself on the following symptoms, based on how you feel now."*

To be completed by the athlete. In situations where the symptom scale is being completed after exercise, it should still be done in a resting state, at least 10 minutes post exercise.

For total number of symptoms, maximum possible is 22.

For Symptom severity score, add all scores in table, maximum possible is  $22 \times 6 = 132$ .

### SAC<sup>4</sup>

#### Immediate Memory

*"I am going to test your memory. I will read you a list of words and when I am done, repeat back as many words as you can remember, in any order."*

#### Trials 2 & 3:

*"I am going to repeat the same list again. Repeat back as many words as you can remember in any order, even if you said the word before."*

Complete all 3 trials regardless of score on trial 1 & 2. Read the words at a rate of one per second. **Score 1 pt. for each correct response.** Total score equals sum across all 3 trials. Do not inform the athlete that delayed recall will be tested.

#### Concentration

##### Digits backward

*"I am going to read you a string of numbers and when I am done, you repeat them back to me backwards, in reverse order of how I read them to you. For example, if I say 7-1-9, you would say 9-1-7."*

If correct, go to next string length. If incorrect, read trial 2. **One point possible for each string length.** Stop after incorrect on both trials. The digits should be read at the rate of one per second.

##### Months in reverse order

*"Now tell me the months of the year in reverse order. Start with the last month and go backward. So you'll say December, November ... Go ahead"*

**1 pt. for entire sequence correct**

##### Delayed Recall

The delayed recall should be performed after completion of the Balance and Coordination Examination.

*"Do you remember that list of words I read a few times earlier? Tell me as many words from the list as you can remember in any order."*

**Score 1 pt. for each correct response**

## Balance Examination

### Modified Balance Error Scoring System (BESS) testing<sup>3</sup>

This balance testing is based on a modified version of the Balance Error Scoring System (BESS)<sup>3</sup>. A stopwatch or watch with a second hand is required for this testing.

*"I am now going to test your balance. Please take your shoes off, roll up your pant legs above ankle (if applicable), and remove any ankle taping (if applicable). This test will consist of three twenty-second tests with different stances."*

#### (a) Double leg stance:

*"The first stance is standing with your feet together with your hands on your hips and with your eyes closed. You should try to maintain stability in that position for 20 seconds. I will be counting the number of times you move out of this position. I will start timing when you are set and have closed your eyes."*

#### (b) Single leg stance:

*"If you were to kick a ball, which foot would you use? [This will be the dominant foot] Now stand on your non-dominant foot. The dominant leg should be held in approximately 30 degrees of hip flexion and 45 degrees of knee flexion. Again, you should try to maintain stability for 20 seconds with your hands on your hips and your eyes closed. I will be counting the number of times you move out of this position. If you stumble out of this position, open your eyes and return to the start position and continue balancing. I will start timing when you are set and have closed your eyes."*

#### (c) Tandem stance:

*"Now stand heel-to-toe with your non-dominant foot in back. Your weight should be evenly distributed across both feet. Again, you should try to maintain stability for 20 seconds with your hands on your hips and your eyes closed. I will be counting the number of times you move out of this position. If you stumble out of this position, open your eyes and return to the start position and continue balancing. I will start timing when you are set and have closed your eyes."*

### Balance testing – types of errors

1. Hands lifted off iliac crest
2. Opening eyes
3. Step, stumble, or fall
4. Moving hip into > 30 degrees abduction
5. Lifting forefoot or heel
6. Remaining out of test position > 5 sec

Each of the 20-second trials is scored by counting the errors, or deviations from the proper stance, accumulated by the athlete. The examiner will begin counting errors only after the individual has assumed the proper start position. **The modified BESS is calculated by adding one error point for each error during the three 20-second tests. The maximum total number of errors for any single condition is 10.** If an athlete commits multiple errors simultaneously, only one error is recorded but the athlete should quickly return to the testing position, and counting should resume once subject is set. Subjects that are unable to maintain the testing procedure for a minimum of **five seconds** at the start are assigned the highest possible score, ten, for that testing condition.

**OPTION:** For further assessment, the same 3 stances can be performed on a surface of medium density foam (e.g., approximately 50cmx40cmx6cm).

### Tandem Gait<sup>6,7</sup>

*Participants are instructed to stand with their feet together behind a starting line (the test is best done with footwear removed). Then, they walk in a forward direction as quickly and as accurately as possible along a 38mm wide (sports tape), 3 meter line with an alternate foot heel-to-toe gait ensuring that they approximate their heel and toe on each step. Once they cross the end of the 3m line, they turn 180 degrees and return to the starting point using the same gait. A total of 4 trials are done and the best time is retained. Athletes should complete the test in 14 seconds. Athletes fail the test if they step off the line, have a separation between their heel and toe, or if they touch or grab the examiner or an object. In this case, the time is not recorded and the trial repeated, if appropriate.*

## Coordination Examination

### Upper limb coordination

#### Finger-to-nose (FTN) task:

*"I am going to test your coordination now. Please sit comfortably on the chair with your eyes open and your arm (either right or left) outstretched (shoulder flexed to 90 degrees and elbow and fingers extended), pointing in front of you. When I give a start signal, I would like you to perform five successive finger to nose repetitions using your index finger to touch the tip of the nose, and then return to the starting position, as quickly and as accurately as possible."*

**Scoring: 5 correct repetitions in < 4 seconds = 1**

**Note for testers:** Athletes fail the test if they do not touch their nose, do not fully extend their elbow or do not perform five repetitions. **Failure should be scored as 0.**

## References & Footnotes

1. This tool has been developed by a group of international experts at the 4th International Consensus meeting on Concussion in Sport held in Zurich, Switzerland in November 2012. The full details of the conference outcomes and the authors of the tool are published in The BJSM Injury Prevention and Health Protection, 2013, Volume 47, Issue 5. The outcome paper will also be simultaneously co-published in other leading biomedical journals with the copyright held by the Concussion in Sport Group, to allow unrestricted distribution, providing no alterations are made.
2. McCrory P et al., Consensus Statement on Concussion in Sport – the 3rd International Conference on Concussion in Sport held in Zurich, November 2008. British Journal of Sports Medicine 2009; 43: 176–89.
3. Maddocks, DL; Dicker, GD; Saling, MM. The assessment of orientation following concussion in athletes. Clinical Journal of Sport Medicine, 1995; 5(1): 32–3.
4. McCreary M. Standardized mental status testing of acute concussion. Clinical Journal of Sport Medicine, 2001; 11: 176–181.
5. Guskiewicz KM. Assessment of postural stability following sport-related concussion. Current Sports Medicine Reports. 2003; 2: 24–30.
6. Schneiders, A.G., Sullivan, S.J., Gray, A., Hammond-Tooke, G. & McCrory, P. Normative values for 16–37 year old subjects for three clinical measures of motor performance used in the assessment of sports concussions. Journal of Science and Medicine in Sport, 2010; 13(2): 196–201.
7. Schneiders, A.G., Sullivan, S.J., Kvarnstrom, J.K., Olsson, M., Yden, T. & Marshall, S.W. The effect of footwear and sports-surface on dynamic neurological screening in sport-related concussion. Journal of Science and Medicine in Sport, 2010; 13(4): 382–386



## Appendix E

### Child Sport Concussion Assessment Tool (Child-SCAT 3) – 3<sup>rd</sup> Edition

Downloaded from [bjsm.bmj.com](http://bjsm.bmj.com) on March 12, 2013 - Published by [group.bmj.com](http://group.bmj.com)

## Child-SCAT3™

### Sport Concussion Assessment Tool for children ages 5 to 12 years

For use by medical professionals only

#### What is childSCAT3?¹

The ChildSCAT3 is a standardized tool for evaluating injured children for concussion and can be used in children aged from 5 to 12 years. It supersedes the original SCAT and the SCAT2 published in 2005 and 2009, respectively¹. For older persons, ages 13 years and over, please use the SCAT3. The ChildSCAT3 is designed for use by medical professionals. If you are not qualified, please use the Sport Concussion Recognition Tool. Pre-season baseline testing with the ChildSCAT3 can be helpful for interpreting post-injury test scores.

Specific instructions for use of the ChildSCAT3 are provided on page 3. If you are not familiar with the ChildSCAT3, please read through these instructions carefully. This tool may be freely copied in its current form for distribution to individuals, teams, groups and organizations. Any revision and any reproduction in a digital form require approval by the Concussion in Sport Group.

**NOTE:** The diagnosis of a concussion is a clinical judgment, ideally made by a medical professional. The ChildSCAT3 should not be used solely to make, or exclude, the diagnosis of concussion in the absence of clinical judgement. An athlete may have a concussion even if their ChildSCAT3 is "normal".

#### What is a concussion?

A concussion is a disturbance in brain function caused by a direct or indirect force to the head. It results in a variety of non-specific signs and/or symptoms (like those listed below) and most often does not involve loss of consciousness. Concussion should be suspected in the presence of any one or more of the following:

- Symptoms (e.g., headache), or
- Physical signs (e.g., unsteadiness), or
- Impaired brain function (e.g. confusion) or
- Abnormal behaviour (e.g., change in personality).

### SIDELINE ASSESSMENT

#### Indications for Emergency Management

**NOTE:** A hit to the head can sometimes be associated with a more severe brain injury. If the concussed child displays any of the following, then do not proceed with the ChildSCAT3; instead activate emergency procedures and urgent transportation to the nearest hospital:

- Glasgow Coma score less than 15
- Deteriorating mental status
- Potential spinal injury
- Progressive, worsening symptoms or new neurologic signs
- Persistent vomiting
- Evidence of skull fracture
- Post traumatic seizures
- Coagulopathy
- History of Neurosurgery (eg Shunt)
- Multiple injuries

#### 1 Glasgow coma scale (GCS)

##### Best eye response (E)

No eye opening	1
Eye opening in response to pain	2
Eye opening to speech	3
Eyes opening spontaneously	4

##### Best verbal response (V)

No verbal response	1
Incomprehensible sounds	2
Inappropriate words	3
Confused	4
Oriented	5

##### Best motor response (M)

No motor response	1
Extension to pain	2
Abnormal flexion to pain	3
Flexion/Withdrawal to pain	4
Localizes to pain	5
Obeys commands	6

**Glasgow Coma score (E + V + M)** of 15

GCS should be recorded for all athletes in case of subsequent deterioration.

#### Potential signs of concussion?

If any of the following signs are observed after a direct or indirect blow to the head, the child should stop participation, be evaluated by a medical professional and **should not be permitted to return to sport the same day** if a concussion is suspected.

- Any loss of consciousness?  Y  N
- "If so, how long?" \_\_\_\_\_
- Balance or motor incoordination (stumbles, slow/laboured movements, etc.)?  Y  N
- Disorientation or confusion (inability to respond appropriately to questions)?  Y  N
- Loss of memory:  Y  N
- "If so, how long?" \_\_\_\_\_
- "Before or after the injury?" \_\_\_\_\_
- Blank or vacant look:  Y  N
- Visible facial injury in combination with any of the above:  Y  N

#### 2 Sideline Assessment – child-Maddocks Score³

"I am going to ask you a few questions, please listen carefully and give your best effort."

Modified Maddocks questions (1 point for each correct answer)

Where are we at now?	0	1
Is it before or after lunch?	0	1
What did you have last lesson/class?	0	1
What is your teacher's name?	0	1

**child-Maddocks score** of 4

Child-Maddocks score is for sideline diagnosis of concussion only and is not used for serial testing.

**Any child with a suspected concussion should be REMOVED FROM PLAY, medically assessed and monitored for deterioration (i.e., should not be left alone). No child diagnosed with concussion should be returned to sports participation on the day of injury.**

### BACKGROUND

Name: \_\_\_\_\_ Date/Time of Injury: \_\_\_\_\_  
 Examiner: \_\_\_\_\_ Date of Assessment: \_\_\_\_\_  
 Sport/team/school: \_\_\_\_\_  
 Age: \_\_\_\_\_ Gender:  M  F  
 Current school year/grade: \_\_\_\_\_  
 Dominant hand:  right  left  neither  
 Mechanism of Injury ("tell me what happened?"): \_\_\_\_\_

#### For Parent/carer to complete:

- How many concussions has the child had in the past? \_\_\_\_\_
- When was the most recent concussion? \_\_\_\_\_
- How long was the recovery from the most recent concussion? \_\_\_\_\_
- Has the child ever been hospitalized or had medical imaging done (CT or MRI) for a head injury?  Y  N
- Has the child ever been diagnosed with headaches or migraines?  Y  N
- Does the child have a learning disability, dyslexia, ADD/ADHD, seizure disorder?  Y  N
- Has the child ever been diagnosed with depression, anxiety or other psychiatric disorder?  Y  N
- Has anyone in the family ever been diagnosed with any of these problems?  Y  N
- Is the child on any medications? If yes, please list:  Y  N



Downloaded from [bjsm.bmj.com](http://bjsm.bmj.com) on March 12, 2013 - Published by [group.bmj.com](http://group.bmj.com)

**SYMPTOM EVALUATION**

**3 Child report**

Name: \_\_\_\_\_

	never	rarely	sometimes	often
I have trouble paying attention	0	1	2	3
I get distracted easily	0	1	2	3
I have a hard time concentrating	0	1	2	3
I have problems remembering what people tell me	0	1	2	3
I have problems following directions	0	1	2	3
I daydream too much	0	1	2	3
I get confused	0	1	2	3
I forget things	0	1	2	3
I have problems finishing things	0	1	2	3
I have trouble figuring things out	0	1	2	3
It's hard for me to learn new things	0	1	2	3
I have headaches	0	1	2	3
I feel dizzy	0	1	2	3
I feel like the room is spinning	0	1	2	3
I feel like I'm going to faint	0	1	2	3
Things are blurry when I look at them	0	1	2	3
I see double	0	1	2	3
I feel sick to my stomach	0	1	2	3
I get tired a lot	0	1	2	3
I get tired easily	0	1	2	3

**Total number of symptoms** (Maximum possible 20) \_\_\_\_\_

**Symptom severity score** (Maximum possible 20 x 3 = 60) \_\_\_\_\_

self rated     clinician interview     self rated and clinician monitored

**4 Parent report**

The child

	never	rarely	sometimes	often
has trouble sustaining attention	0	1	2	3
Is easily distracted	0	1	2	3
has difficulty concentrating	0	1	2	3
has problems remembering what he/she is told	0	1	2	3
has difficulty following directions	0	1	2	3
tends to daydream	0	1	2	3
gets confused	0	1	2	3
is forgetful	0	1	2	3
has difficulty completing tasks	0	1	2	3
has poor problem solving skills	0	1	2	3
has problems learning	0	1	2	3
has headaches	0	1	2	3
feels dizzy	0	1	2	3
has a feeling that the room is spinning	0	1	2	3
feels faint	0	1	2	3
has blurred vision	0	1	2	3
has double vision	0	1	2	3
experiences nausea	0	1	2	3
gets tired a lot	0	1	2	3
gets tired easily	0	1	2	3

**Total number of symptoms** (Maximum possible 20) \_\_\_\_\_

**Symptom severity score** (Maximum possible 20 x 3 = 60) \_\_\_\_\_

Do the symptoms get worse with physical activity?  Y  N

Do the symptoms get worse with mental activity?  Y  N

parent self rated     clinician interview     parent self rated and clinician monitored

**Overall rating** for parent/teacher/coach/carer to answer.  
How different is the child acting compared to his/her usual self?  
Please circle one response:  
 no different     very different     unsure     N/A

Name of person completing Parent-report: \_\_\_\_\_  
Relationship to child of person completing Parent-report: \_\_\_\_\_

**COGNITIVE & PHYSICAL EVALUATION**

**5 Cognitive assessment**  
**Standardized Assessment of Concussion – Child Version (SAC-C)\***

**Orientation** (1 point for each correct answer)

What month is it?	0	1
What is the date today?	0	1
What is the day of the week?	0	1
What year is it?	0	1

**Orientation score** \_\_\_\_\_ of 4

**Immediate memory**

List	Trial 1	Trial 2	Trial 3	Alternative word list			
elbow	0	1	0	1	candle	baby	finger
apple	0	1	0	1	paper	monkey	penny
carpet	0	1	0	1	sugar	perfume	blanket
saddle	0	1	0	1	sandwich	sunset	lemon
bubble	0	1	0	1	wagon	iron	insect

**Total** \_\_\_\_\_

**Immediate memory score total** \_\_\_\_\_ of 15

**Concentration: Digits Backward**

List	Trial 1	Alternative digit list			
6-2	0	1	5-2	4-1	4-9
4-9-3	0	1	6-2-9	5-2-6	4-1-5
3-8-1-4	0	1	3-2-7-9	1-7-9-5	4-9-6-8
6-2-9-7-1	0	1	1-5-2-8-6	3-8-5-2-7	6-1-8-4-3
7-1-8-4-6-2	0	1	5-3-9-1-4-8	8-3-1-9-6-4	7-2-4-8-5-6

**Total of 5** \_\_\_\_\_

**Concentration: Days in Reverse Order** (1 pt. for entire sequence correct)

Sunday-Saturday-Friday-Thursday-Wednesday-Tuesday-Monday	0	1
--	---	---

**Concentration score** \_\_\_\_\_ of 6

**6 Neck Examination:**

Range of motion    Tenderness    Upper and lower limb sensation & strength

**Findings:** \_\_\_\_\_

**7 Balance examination**

Do one or both of the following tests.  
Footwear (shoes, barefoot, braces, tape, etc.) \_\_\_\_\_

**Modified Balance Error Scoring System (BESS) testing<sup>4</sup>**

Which foot was tested (i.e., which is the **non-dominant** foot)     Left     Right

Testing surface (hard floor, field, etc.) \_\_\_\_\_

**Condition**

Double leg stance: \_\_\_\_\_ Errors

Tandem stance (non-dominant foot at back): \_\_\_\_\_ Errors

**Tandem gait<sup>6,7</sup>**

Time taken to complete (best of 4 trials): \_\_\_\_\_ seconds

If child attempted, but unable to complete tandem gait, mark here

**8 Coordination examination**

**Upper limb coordination**

Which arm was tested: \_\_\_\_\_  Left     Right

**Coordination score** \_\_\_\_\_ of 1

**9 SAC Delayed Recall<sup>4</sup>**

**Delayed recall score** \_\_\_\_\_ of 5

Scoring on the ChildSCAT3 should not be used as a stand-alone method to diagnose concussion, measure recovery or make decisions about an athlete's readiness to return to competition after concussion.

Since signs and symptoms may evolve over time, it is important to consider repeat evaluation in the acute assessment of concussion.

Downloaded from [bjsm.bmj.com](http://bjsm.bmj.com) on March 12, 2013 - Published by [group.bmj.com](http://group.bmj.com)

## INSTRUCTIONS

Words in *italics* throughout the ChildSCAT3 are the instructions given to the child by the tester.

### Sideline Assessment – child-Maddocks Score

To be completed on the sideline/in the playground, immediately following concussion. There is no requirement to repeat these questions at follow-up.

### Symptom Scale<sup>8</sup>

In situations where the symptom scale is being completed after exercise, it should still be done in a resting state, at least 10 minutes post exercise.

#### On the day of injury

- the child is to complete the Child Report, according to how he/she feels now.

#### On all subsequent days

- the child is to complete the Child Report, according to how he/she feels today, and  
- the parent/carer is to complete the Parent Report according to how the child has been over the previous 24 hours.

### Standardized Assessment of Concussion – Child Version (SAC-C)<sup>4</sup>

#### Orientation

Ask each question on the score sheet. A correct answer for each question scores 1 point. If the child does not understand the question, gives an incorrect answer, or no answer, then the score for that question is 0 points.

#### Immediate memory

*"I am going to test your memory. I will read you a list of words and when I am done, repeat back as many words as you can remember, in any order."*

#### Trials 2 & 3:

*"I am going to repeat the same list again. Repeat back as many words as you can remember in any order, even if you said the word before."*

Complete all 3 trials regardless of score on trial 1 & 2. Read the words at a rate of one per second. **Score 1 pt. for each correct response.** Total score equals sum across all 3 trials. Do not inform the child that delayed recall will be tested.

#### Concentration

##### Digits Backward:

*"I am going to read you a string of numbers and when I am done, you repeat them back to me backwards, in reverse order of how I read them to you. For example, if I say 7-1, you would say 1-7."*

If correct, go to next string length. If incorrect, read trial 2. **One point possible for each string length.** Stop after incorrect on both trials. The digits should be read at the rate of one per second.

##### Days in Reverse Order:

*"Now tell me the days of the week in reverse order. Start with Sunday and go backward. So you'll say Sunday, Saturday... Go ahead"*

**1 pt. for entire sequence correct**

##### Delayed recall

The delayed recall should be performed after completion of the Balance and Coordination Examination.

*"Do you remember that list of words I read a few times earlier? Tell me as many words from the list as you can remember in any order."*

Circle each word correctly recalled. **Total score equals number of words recalled.**

### Balance examination

These instructions are to be read by the person administering the childSCAT3, and each balance task should be demonstrated to the child. The child should then be asked to copy what the examiner demonstrated.

#### Modified Balance Error Scoring System (BESS) testing<sup>5</sup>

This balance testing is based on a modified version of the Balance Error Scoring System (BESS). A stopwatch or watch with a second hand is required for this testing.

*"I am now going to test your balance. Please take your shoes off, roll up your pant legs above ankle (if applicable), and remove any ankle taping (if applicable). This test will consist of two different parts."*

##### (a) Double leg stance:

*The first stance is standing with the feet together with hands on hips and with eyes closed. The child should try to maintain stability in that position for 20 seconds. You should inform the child that you will be counting the number of times the child moves out of this position. You should start timing when the child is set and the eyes are closed.*

##### (b) Tandem stance:

*Instruct the child to stand heel-to-toe with the non-dominant foot in the back. Weight should be evenly distributed across both feet. Again, the child should try to maintain stability for 20 seconds with hands on hips and eyes closed. You should inform the child that you will be counting the number of times the child moves out of this position. If the child stumbles out of this position, instruct him/her to open the eyes and return to the start position and continue balancing. You should start timing when the child is set and the eyes are closed.*

### Balance testing – types of errors - Parts (a) and (b)

1. Hands lifted off iliac crest
2. Opening eyes
3. Step, stumble, or fall
4. Moving hip into > 30 degrees abduction
5. Lifting forefoot or heel
6. Remaining out of test position > 5 sec

Each of the 20-second trials is scored by counting the errors, or deviations from the proper stance, accumulated by the child. The examiner will begin counting errors only after the child has assumed the proper start position. **The modified BESS is calculated by adding one error point for each error during the two 20-second tests. The maximum total number of errors for any single condition is 10.** If a child commits multiple errors simultaneously, only one error is recorded but the child should quickly return to the testing position, and counting should resume once subject is set. Children who are unable to maintain the testing procedure for a minimum of **five seconds** at the start are assigned the highest possible score, ten, for that testing condition.

**OPTION:** For further assessment, the same 2 stances can be performed on a surface of medium density foam (e.g., approximately 50cmx40cmx6cm).

### Tandem Gait<sup>6,7</sup>

Use a clock (with a second hand) or stopwatch to measure the time taken to complete this task. Instruction for the examiner – **Demonstrate the following to the child:**

*The child is instructed to stand with their feet together behind a starting line (the test is best done with footwear removed). Then, they walk in a forward direction as quickly and as accurately as possible along a 38mm wide (sports tape), 3 meter line with an alternate foot heel-toe gait ensuring that they approximate their heel and toe on each step. Once they cross the end of the 3m line, they turn 180 degrees and return to the starting point using the same gait. A total of 4 trials are done and the best time is retained. Children fail the test if they step off the line, have a separation between their heel and toe, or if they touch or grab the examiner or an object. In this case, the time is not recorded and the trial repeated, if appropriate.*

Explain to the child that you will time how long it takes them to walk to the end of the line and back.

### Coordination examination

#### Upper limb coordination

##### Finger-to-nose (FTN) task:

The tester should demonstrate it to the child.

*"I am going to test your coordination now. Please sit comfortably on the chair with your eyes open and your arm (either right or left) outstretched (shoulder flexed to 90 degrees and elbow and fingers extended). When I give a start signal, I would like you to perform five successive finger to nose repetitions using your index finger to touch the tip of the nose as quickly and as accurately as possible."*

**Scoring: 5 correct repetitions in < 4 seconds = 1**

**Note for testers:** Children fail the test if they do not touch their nose, do not fully extend their elbow or do not perform five repetitions. **Failure should be scored as 0.**

### References & Footnotes

1. This tool has been developed by a group of international experts at the 4th International Consensus meeting on Concussion in Sport held in Zurich, Switzerland in November 2012. The full details of the conference outcomes and the authors of the tool are published in The BJSM Injury Prevention and Health Protection, 2013, Volume 47, Issue 5. The outcome paper will also be simultaneously co-published in other leading biomedical journals with the copyright held by the Concussion in Sport Group, to allow unrestricted distribution, providing no alterations are made.
2. McCrory P et al., Consensus Statement on Concussion in Sport – the 3rd International Conference on Concussion in Sport held in Zurich, November 2008. British Journal of Sports Medicine 2009; 43: 176-89.
3. Maddocks, DL; Dicker, GD; Saling, MM. The assessment of orientation following concussion in athletes. Clinical Journal of Sport Medicine. 1995; 5(1): 32-3.
4. McCrea M. Standardized mental status testing of acute concussion. Clinical Journal of Sport Medicine. 2001; 11: 176-181.
5. Guskiewicz KM. Assessment of postural stability following sport-related concussion. Current Sports Medicine Reports. 2003; 2: 24-30.
6. Schneiders, A.G., Sullivan, S.J., Gray, A., Hammond-Tooke, G & McCrory, P. Normative values for 16-37 year old subjects for three clinical measures of motor performance used in the assessment of sports concussions. Journal of Science and Medicine in Sport. 2010; 13(2): 196-201.
7. Schneiders, A.G., Sullivan, S.J., Kvarnstrom, J.K., Olsson, M., Yden, T. & Marshall, S.W. The effect of footwear and sports-surface on dynamic neurological screening in sport-related concussion. Journal of Science and Medicine in Sport. 2010; 13(4): 382-386
8. Ayr, L.K., Yeates, K.O., Taylor, H.G., & Brown, M. Dimensions of post-concussive symptoms in children with mild traumatic brain injuries. Journal of the International Neuropsychological Society, 2009; 15:19-30.

Downloaded from [bjsm.bmj.com](http://bjsm.bmj.com) on March 12, 2013 - Published by [group.bmj.com](http://group.bmj.com)

### CHILD ATHLETE INFORMATION

Any child suspected of having a concussion should be removed from play, and then seek medical evaluation. The child must NOT return to play or sport on the same day as the suspected concussion.

#### Signs to watch for

Problems could arise over the first 24–48 hours. The child should not be left alone and must go to a hospital at once if they develop any of the following:

- New Headache, or Headache gets worse
- Persistent or increasing neck pain
- Becomes drowsy or can't be woken up
- Can not recognise people or places
- Has Nausea or Vomiting
- Behaves unusually, seems confused, or is irritable
- Has any seizures (arms and/or legs jerk uncontrollably)
- Has weakness, numbness or tingling (arms, legs or face)
- Is unsteady walking or standing
- Has slurred speech
- Has difficulty understanding speech or directions

**Remember, it is better to be safe. Always consult your doctor after a suspected concussion.**

#### Return to school

Concussion may impact on the child's cognitive ability to learn at school. This must be considered, and medical clearance is required before the child may return to school. **It is reasonable for a child to miss a day or two of school after concussion, but extended absence is uncommon.** In some children, a graduated return to school program will need to be developed for the child. The child will progress through the return to school program provided that there is no worsening of symptoms. If any particular activity worsens symptoms, the child will abstain from that activity until it no longer causes symptom worsening. Use of computers and internet should follow a similar graduated program, provided that it does not worsen symptoms. This program should include communication between the parents, teachers, and health professionals and will vary from child to child. The return to school program should consider:

- Extra time to complete assignments/tests
- Quiet room to complete assignments/tests
- Avoidance of noisy areas such as cafeterias, assembly halls, sporting events, music class, shop class, etc
- Frequent breaks during class, homework, tests
- No more than one exam/day
- Shorter assignments
- Repetition/memory cues
- Use of peer helper/tutor
- Reassurance from teachers that student will be supported through recovery through accommodations, workload reduction, alternate forms of testing
- Later start times, half days, only certain classes

**The child is not to return to play or sport until he/she has successfully returned to school/learning, without worsening of symptoms. Medical clearance should be given before return to play.**

If there are any doubts, management should be referred to a qualified health practitioner, expert in the management of concussion in children.

#### Return to sport

There should be no return to play until the child has successfully returned to school/learning, without worsening of symptoms.

**Children must not be returned to play the same day of injury.** When returning children to play, they should **medically cleared and then follow a stepwise supervised program**, with stages of progression.

For example:

Rehabilitation stage	Functional exercise at each stage of rehabilitation	Objective of each stage
No activity	Physical and cognitive rest	Recovery
Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity, 70% maximum predicted heart rate. No resistance training	Increase heart rate
Sport-specific exercise	Skating drills in ice hockey, running drills in soccer. No head impact activities	Add movement
Non-contact training drills	Progression to more complex training drills, eg passing drills in football and ice hockey. May start progressive resistance training	Exercise, coordination, and cognitive load
Full contact practice	Following medical clearance participate in normal training activities	Restore confidence and assess functional skills by coaching staff
Return to play	Normal game play	

There should be approximately 24 hours (or longer) for each stage and the child should drop back to the previous asymptomatic level if any post-concussive symptoms recur. Resistance training should only be added in the later stages. If the child is symptomatic for more than 10 days, then review by a health practitioner, expert in the management of concussion, is recommended.

**Medical clearance should be given before return to play.**

#### Notes:

---



---



---



---

### CONCUSSION INJURY ADVICE FOR THE CHILD AND PARENTS / CARERS

(To be given to the **person monitoring** the concussed child)

This child has received an injury to the head. A careful medical examination has been carried out and no sign of any serious complications has been found. It is expected that recovery will be rapid, but the child will need monitoring for the next 24 hours by a responsible adult.

**If you notice any change in behavior, vomiting, dizziness, worsening headache, double vision or excessive drowsiness, please call an ambulance to transport the child to hospital immediately.**

#### Other important points:

- Following concussion, the child should rest for at least 24 hours.
- The child should avoid any computer, internet or electronic gaming activity if these activities make symptoms worse.
- The child should not be given any medications, including pain killers, unless prescribed by a medical practitioner.
- The child must not return to school until medically cleared.
- The child must not return to sport or play until medically cleared.

Clinic phone number

Patient's name \_\_\_\_\_

Date/time of injury \_\_\_\_\_

Date/time of medical review \_\_\_\_\_

Treating physician \_\_\_\_\_

Contact details or stamp