Concussion Brain Injury

Anatomy of a concussion
Here is what happens to the brain to cause a concussion:

Initial impact
1. The force from the impact causes the brain to strike the inner surface of the skull and rebound against the opposite side.
2. In severe concussions as the brain rebounds, it twists.
3. The brain swells. In a severe injury, the swelling puts pressure on the brain stem, which controls breathing and other basic life functions.

A concussion is a violent jarring or shaking that results in a disturbance of brain function.

Sources: Dr. Jay Rosenblatt of Kaiser Permanente Medical Care Neurology; American Academy of Neurology, The Human Brain

Author - Editor: Professor of Medicine Desire’ Dubounet, D. Sc. L.P.C.C.
Concussion: A traumatic brain injury that changes the way your brain functions.

This can lead to bruising and swelling of the brain, tearing of blood vessels and injury to nerves, causing the concussion.

The brain is made up of soft tissue and is protected by blood and spinal fluid. When the skull is jolted too fast or is impacted by something, the brain shifts and hits against the skull.

Most concussions are mild and can be treated with appropriate care. But left untreated, it can be deadly.

School of hard knocks

A concussion occurs when a violent blow to the head causes the brain to slam against the skull beyond the ability of the cerebrospinal fluid to cushion the impact. Between 1996 and 2001, NFL teams reported nearly 900 concussions.

1. When a football player takes a hit to the head, speeds range from 17 to 25 miles per hour with a force averaging 98 times the force of gravity.

A study commissioned by the NFL revealed most hits occurred from a blow to the side of the head, often on the lower half of the face.

2. The shock wave passes through the brain and bounces back off the skull. The concussion usually occurs at the opposite side from the point of impact.

3. The impact can cause bruising of the brain, tearing of blood vessels and nerve damage.

Symptoms

Immediate
- Confusion
- Amnesia
- Loss of consciousness
- Ringing in the ears
- Nausea and vomiting
- Convulsions

Delayed
- Irritability
- Headaches
- Depression
- Sleep disorders
- Poor concentration
- Trouble with memory

Cumulative effects

Studies show that prior concussions may lower the threshold for subsequent concussion injury and increase severity of symptoms.

Sources: MayoClinic.com, BrainInjuries, Washington Post, ScienceDaily, kidsthealth.org, Kaiser Permanente

Andrew Lucas, Jeff Goertzen | The Denver Post
Concussion – Look to the Eyes

by DR MICHAEL TRAYFORD on MARCH 3, 2012

While a thorough neurological history and examination with a qualified professional should be performed for any suspected head injury, particular emphasis should be placed on the cranial nerves – the nerves that exit your brain and brainstem. Of these cranial nerves, the most telling findings will likely come from the ones involved in vision and eye movement (cranial nerves 2, 3, 4 and 6). It is also critical to assess higher brain centers that control various eye reflexes, which will be discussed later in this article, during the eye examination as well.

There are many types and causes of head injury, but, by far, the most common are concussions related to motor vehicle accidents and contact sports. Concussion comes from the Latin ‘Concutere’, which means to shake violently. Most experts would agree that these are the least serious type of brain injury; yet left untreated many can suffer devastating and debilitating consequences such as vertigo/dizziness, balance problems, cognitive dysfunction, emotional disorders, headaches, and many others.

Given concussions are ascribed this ‘low severity’ status, timely evaluation and treatment is often poor or non-existent at best. Patients are often treated with a ‘sit-and-wait’ approach; meaning it is only after signs and symptoms have manifested and worsened that people often seek care of their own accord. This is entirely unacceptable as early intervention is critical with concussion, as is the case with most disorders of humankind, and it may significantly decrease the likelihood of more serious consequences. The longer one’s brain is adapting to negative changes incurred as a result of a head injury (referred to as maladaptive plasticity), the longer it will take to rehabilitate their way out of them!
Shifting our focus back to the eyes (pun intended); most individuals that have suffered a concussion will complain of some type of symptom related to eye function (e.g. blurry vision, light sensitivity-photophobia, eye fatigue, double vision-diplopia, reading difficulties, etc.). I cannot honestly recall a single case of concussion presenting to my office in the recent years that did not have some type of visual or oculomotor (eye movement) consequence.

We have all seen at some point on TV or the ‘Big Screen’ a doctor shining a light in someone’s eyes to look for lack of pupil constriction as the one and only diagnostic factor for concussion. Well I’m here to tell you that they need to be looking at a great deal more than that! Some basic tests to look for when you or a loved one is being examined for suspected concussion are as follows:

1) Observation for eye malposition

2) Direct and indirect pupil response to light (as noted above)

3) Cardinal fields of gaze (eye movements in all directions)

4) Eye convergence (crossing of the eyes – as your mother told you to never do!)

5) Ophthalmoscopic examination (looking inside the eyes)

6) Visual acuity/Snellen chart (how well you see)

7) Eye cover/uncover testing (more sensitive test for eye deviation)

8) Eye dominance and/or suppression testing

While not an exhaustive list, these tests can be done in a very short period of time (5 minutes or less) with very little equipment and can reveal a great deal about the integrity of these cranial nerves, as well as the higher brain centers that regulate these functions.
That said, there are a host of other very sensitive tests that can offer clinicians incredibly valuable insight into the workings of the ocular (eye) system and its connections with most parts of the brain.

1) Vestibulo-ocular reflex (VOR) testing – often performed with the patient focusing on an object while the examiner moves the head, or while the patient is rotated in a chair

2) Testing for eye saccades (fast movements between targets) – movements are typically over or under compensated with concussion

3) Cortical blind spot mapping – mapping of the visual defect created by the optic nerve attaching into your retina where there are no receptors for light (rods/cones)

4) Testing for optokinetic nystagmus (OKN) – reflexive eye movement caused by tracking of movement within a visual field (i.e. similar to looking out a car’s side window while moving)

5) Electronystagmography (ENG) – advanced electrical testing of various ocular capabilities
Once again, this is by no means an exhaustive list of assessment tools available to the practitioner for evaluation of the eyes and associated brain systems after a head injury, and evaluation options will vary depending on the type of practitioner utilized for assessment (e.g. DC, DO, MD, PT, PhD, etc).

In my humble opinion, given their astute focus on ‘functional’ abnormalities of the nervous system, functional neurologists such as Chiropractic Neurologists and Neuropsychologists are best equipped to deal with these types of conditions; meaning those injuries where there is no observable ‘structural’ damage to the brain. It is no secret that our modern health care system fails to acknowledge and treat these ‘functional’ brain injuries effectively and the long term ramifications of this ‘sit-and-wait’ behavior can be absolutely devastating.

In closing, while I agree there is a greater awareness of brain injury given the publicity provided to it primarily from the great men and women that have been injured serving our country in the past decade or so; I still feel the attention and treatment given to those with ‘milder’ brain injuries like concussion is poor at best within our current system. And this opinion is validated and reinforced daily in my clinic when I see the changes in folks and their families that have been advised to ‘sit-and-wait’. While many sports programs at all levels are implementing strategies such as sideline visual tests like the King-Devick test that are remarkable for evaluating concussion within minutes of the injury, the passive after-care approaches have not changed a whole lot. I am here, along with my colleagues, to ensure that those suffering concussions do not ‘sit-and-wait’, and that they get the evaluation and intervention necessary to return them to their pre-injury (or better) status. Please help us in this mission and pass this on to everyone you know as no one is immune to the possibility of head injury!

1-Minute Sideline Test Predicts Concussions

After Blow to Head, Eye Test Tells Whether Player Should Stay in Game

By Daniel J. DeNoon
WebMD Health News
Reviewed by Laura J. Martin, MD
Feb. 4, 2011 -- Should Green Bay Packers quarterback Aaron Rodgers have stayed in a crucial playoff game after taking a violent blow to the head?

A Super Bowl berth was the ultimate outcome. But had Rodgers taken a new one-minute concussion test on the sidelines, his coaches would have known whether he was at risk of a far worse outcome: serious brain damage.
The test is simple. Before the game, a coach or trainer shows each athlete a set of three index cards. Each card has a series of numbers scattered across eight lines. The athlete reads the numbers from left to right.

After a blow to the head, the athlete goes to the sidelines and retakes the test. If he's five seconds slower, he may have suffered a concussion -- and is at serious risk if his head gets hit again.

It sounds too simple to be true, especially because only the most sophisticated brain scans can detect many concussion effects.

But it turns out that eye movement is strongly linked to neurological function. The simple test, called the King-Devick or K-D test, shows whether eye movement is impaired. If so, it's likely that the athlete has suffered a concussion.

**Concussion Test ID's Brain Damage Risk**

A single, first-time concussion often heals without incident. But before it heals, it makes a person extremely vulnerable to brain damage from a second head trauma.

It's not a small problem. It's estimated that every season, one in five U.S. athletes in a contact sport suffers a concussion. A second concussion can be very bad news indeed. And athletes hit in the head may suffer brain injury even if not diagnosed with concussion.

About 17% of boxers, for example, develop a form of dementia called chronic traumatic encephalopathy (CTE). CTE also affects athletes in other contact sports such as football, soccer, and hockey. Symptoms, which can be disabling, include chronic headaches, fatigue, sleep difficulties, sensitivity to light and noise, dizziness, and short-term memory loss.

"Concussion is a complex type of brain injury that is not visible on the routine scans we do of the brain, yet is detectable when we measure important aspects of brain function, such as vision," study researcher Kristin Galetta of the University of Pennsylvania says in a news release.

"If validated in future studies, this test has the potential to become a standard sideline test for athletes," senior study researcher Laura Balcer, MD, says in the news release.

Galetta, Balcer, and colleagues tried out the test on 27 boxers and 12 mixed-martial-arts fighters. All took the K-D test before and after a sparring bout (boxers) or a match (MMA fighters). A doctor with experience in both sports rated each participant for blows taken to the head.
SCIO TREATMENT SUGGESTED FOR CONCUSSIONS

**Color - Blue**

**Cosmic:** set 1 for physical body

**Magnetic Method:** 5 for inflammation, 9 for psych stress, 2 for energy stimulation

**Frequency** – 9 to 1111 hz

**Injury treatment and Neurological repair**

**Auto Trivector** for 30 min once a day in early stages once a week in later stage
Title: SCIO Eductor for Concussion

Part of the Following:

Large Scale Study of the Safety and Efficacy
of the SCIO/Eductor Device

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Abstract:

This study demonstrates the safety and effective qualities of the SCIO device used in a large scale study. A large scale study of over 100,000 patients with over 300,000 patient visits reported their diseases. Many of them reported concussion. And the results of their therapy are reported in this study. 59 cases of concussion were treated 60% improvement was seen.

Introduction:

Overview:

This large scale research was designed to produce an extensive study of people with a wide variety of diseases to see who gets or feels better while using the SCIO for stress reduction and patient monitoring. The SCIO is an evoked potential Universal Electro-Physiological Medical apparatus that gauges how an individual reacts to miscellaneous homeopathic substances. The device is registered in Europe, America, Canada, S Africa, Australia, S. America, Mexico and elsewhere. The traditional software is fully registered. Some additional functions were determined by the manufacturer to be worthy of evaluation. Thus a study was necessary to determine safety and efficacy. (As a result of these studies these additional functions are now registered within the EC)

An European ethics committee was officially registered and governmental permission attained to do the insignificant risk study. Qualified registered and or licensed Biofeedback therapists where enlisted to perform the study. Therapists were enrolled from all over the world including N. America, Europe, Africa, Australia, Asia, and S. America. They were trained in the aspects of the study and how to attain informed consent and transmit the results to the ethics committee or IRB (Institutional Review Board).

2,569 therapists enlisted in the study. There were 101,201 patients. 69% had more than one visit. 43% had over two visits. There were over 300,000 patient visits recorded. The therapists were trained and supervised by medical staff. They were to perform the SCIO therapy and analysis. They were to report any medical suspected or confirmed diagnosis. Therapist’s personnel are not to diagnose outside of the realm of their scope of practice. Then the therapist is to inquire on any reported changes during the meeting and on follow-ups any measured variations. It must be pointed out that the Therapists were free to do any additional therapies they wish such as homeopathy, nutrition, exercise, etc. Therapists were told to not recommend synthetic drugs. Thus the evaluation was not reduced to just the device but to the total effect of seeing a SCIO therapist.

Part 1. The emphasis was on substantiating safety followed by efficacy of the SCIO.

Part 2. Proving the efficacy of the SCIO on diseases (emphasis on degenerative disease)

Part 3. Proving the efficacy of the SCIO on the Avant Garde therapies of Complementary Med

Part 4. QQC standardization
Methods and Materials:

**SCIO Device:**

The SCIO is an evoked potential Universal Electro-Physiological Medical device that measures how a person reacts to items. It is designed to measure reactions for allergy, homeopathy, nutrition, sarcodes, nosodes, vitamins, minerals, enzymes and many more items. Biofeedback is used for pre-diagnostic work and or therapy.

The QXCI software will allow the unconscious of the patient to guide to repair electrical and vibrational aberrations in your body. For complete functional details and pictures, see appendix.

**Subspace Software:**

The QXCI software is designed for electro-physiological connection to the patient to allow reactivity testing and rectification of subtle abnormalities of the body electric. If a patient is not available a subspace or distance healing link has been designed for subspace therapeutics. Many reports of the success of the subspace have been reported and thus the effectiveness and the safety of the subspace link is part of this test. Many companies have tried to copy the subspace of Prof. Nelson and their counterfeit attempts have ended in failure.

**SOC Index:**

The SCIO interview opens with a behavioral medicine interview. This is called the SOC Index. Named after the work of Samuel Hahnemann the father of homeopathy, he said that the body heals itself with its innate knowledge. But the patient can suppress or obstruct the healing process with some behavior. Hahnemann said that the worst way to interfere with the healing natural process was Allopathy or synthetic drugs. Theses upset the natural healing process by unnatural intervention and regulation disturbance. Other ways to Suppress or Obstruct the Cure are smoking, mercury amalgams, stress, lack of water, exercise and many others. This behavioral survey then gives an index of SOC.

The scores relate to the risk of Suppression and Obstruction to the natural Cure. The higher the scores the more the Suppression and or Obstruction. The scores of 100 or lower are ideal. A copy of the SOC index questions appear in the appendix.

**Study Technicians:**

The study technicians were educated and supervised by medical officers. The study technicians were to execute the SCIO therapy and analysis. All were trained to the standards of the International Medical University of Natural Education. Therapists from all over the world including N. America, Europe, Africa, Australia, Asia, S. America and elsewhere were enlisted to perform the study according to the Helsinki study ethics regulations.

They were to chronicle any medical suspected or confirmed diagnosis. Therapists personnel are not to diagnose outside of the realm of their scope of practice. Then the study technician is to inquire on
any disclosed observations during the test and on follow-ups report any measured changes.

To test the device as subspace against the placebo effect, two of the 2,500+ therapists were given placebo SCIO devices that were totally outwardly the same but were not functional. These two blind therapists were then assigned 35 patients each (only 63 showed). This was to assess the double blind factor of the placebo effect as compared to the device. Thus the studied groups were

A. placebo group,    B. subspace group,    and    C. attached harness group.

Cross placebo group manipulation was used to further evaluate the effect.

**Important Questions:** these are the key questions of the study

1. Define Diseases or Patient Concerns
2. Percentage of Improvement in Symptoms
3. Percentage of Improvement in Feeling Better
4. Percentage of Improvement Measured
5. Percentage of Improvement in Stress Reduction
6. Percentage of Improvement in SOC Behavior
7. What Measured + How (relevant measures to the patient’s health situation)
8. If Patient worsened please describe in detail involving SOC_

After the patient visit was complete the data was e-mailed to the Ethics Committee or IRB for storage and then analysis. This maneuver minimized the risk of data loss or tampering. Case studies were reported separately in the disease analysis.

**MEDICAL DETAILS**

**Concussion**, from the Latin *concutere* ("to shake violently")\[1\] or *concussus* ("action of striking together"),\[2\] is the most common type of *traumatic brain injury*. The terms *mild brain injury*, *mild traumatic brain injury (MTBI)*, *mild head injury* (MHI), *minor head trauma*, and *concussion* may be used interchangeably,\[3\][4][5] although the last is often treated as a narrower category.\[6\] Although the term "concussion" is still used in sports literature as interchangeable with "MHI" or "MTBI", the general clinical medical literature now uses "MTBI" instead.\[6\] In this article, "concussion" and "MTBI" are used interchangeably. Frequently defined as a head injury with a temporary loss of brain function, concussion causes a variety of physical, cognitive, and emotional symptoms, which may not be recognized if subtle.
Results:

Before we review the direct disease improvement profiles, we need to review the overall results. The first most basic of question in the results is the basic feedback of the generic patient conditions.

1. Percentage of Improvement in Symptoms
2. Percentage of Improvement in Feeling Better
3. Percentage of Improvement Measured
4. Percentage of Improvement in Stress Reduction
5. Percentage of Improvement in SOC Behavior

The SOC index gives us great insight to this study. Each disease has a different cut off where the ability of the SCIO to help was compromised. As a general index scores of 200 + where much less successful.

Urinary Incontinence

This disease group total number of patients was 59.

Subspace Treatment 8 patients, 51 SCIO Harness Patients

OVERALL ASSESSMENT

A. Subspace Treatment 8 patient visits

There were 0 cases of patients who reported a negative Improvement. None of these cases reported any major difficulty.

There were

0 cases reporting no improvement of Symptoms, .001% of Subgroup
3 cases reporting no improvement in feeling better, .001% of Subgroup
3 cases reporting no improvement in stress reduction .001% of Subgroup

32%--- Percentage of Improvement in Symptoms
43%--- Percentage of Improvement in Feeling Better
35%-- Percentage of Improvement Measured
40%-- Percentage of Improvement in Stress Reduction
22%---Percentage of Improvement in SOC Behavior

B. SCIO Harness Treatment 75 patient visits

There were 0 cases of patients who reported a negative Improvement. None of these cases reported any major difficulty.

There were

1 case reporting no improvement of Symptoms, 0.01% of Subgroup
4 cases reporting no improvement in feeling better, 0.02% of Subgroup
1 case reporting no improvement in stress reduction 0.01% of Subgroup

65%--- Percentage of Improvement in Symptoms

69%--- Percentage of Improvement in Feeling Better

60%---.Percentage of Improvement Measured

62%-- Percentage of Improvement in Stress Reduction

29%----Percentage of Improvement in SOC Behavior
References


Vision Test Improves Concussion Detection

Sue Hughes
April 29, 2014

PHILADELPHIA — A simple vision test performed on the sidelines can improve the identification of concussion in sports players who have experienced a head injury, a new study suggests.

"The visual pathways are commonly affected in concussion," said author Laura Balcer, MD, New York University School of Medicine. "Adding a vision-based test to evaluate athletes on the sidelines may allow us to better detect more athletes with concussion more quickly. This is particularly important since not all athletes reliably report their symptoms of concussion, including any vision problems."

Coauthor James Clugston, MD, team physician, University of Florida Athletic Department, Gainesville, explained to Medscape Medical News, "We have been doing standard tests based on balance symptoms and cognition tasks but we are not altogether sure that we are picking up subtle concussion injuries with these. So we have started using this vision test to see if we can improve detection rates.

"Sometimes, the athlete does not know they are concussed or they may hide symptoms so as to get back into the game quickly, so we are looking for a test to pick up concussions like this that may not have been identified before."
The study was presented here at the American Academy of Neurology (AAN) 66th Annual Meeting.

**100% Detection With Combination**

The King-Devick test involves the reading of a series of numbers from index cards or an iPad screen, and it takes about 1 minute. This is done at the start of the season as the baseline assessment. After injury the same set of tests are conducted — often on the side of the pitch — and if the time taken is longer than at baseline, then concussion is diagnosed. The test would be repeated every day until the baseline time was reached.

Dr. Clugston noted that there was not a set reduction in score that was classified as concussion; rather, anything less than baseline should raise concern. "After exercise, scores will usually be the same as or faster than baseline. Any slowing in the time taken to complete the tests was the definition of concussion used in this study."

For the study, baseline data for 217 athletes aged 18 to 22 years playing on the University of Florida men’s football, women’s soccer, and women’s lacrosse teams were collected. These included scores on the King-Devick vision test, along with the standard tests currently used: the Standardized Assessment of Concussion (SAC) and Balance Error Scoring System (BESS). The Post-Concussion Scale (PCS) was also used to assess symptom reporting. These tests were performed again after head injury, and analyses examined changes in scores from baseline to post injury.

Results showed that among 30 athletes with first concussion during their athletic season, 79% showed worsening of time scores in the King-Devick vision test. In contrast, the SAC test identified 52% of concussions and the BESS test picked up 70%. Combining the King-Devick vision test and SAC captured 89% of concussions, and using all 3 tests identified 100%.

In addition, symptom severity scores on the PCS worsened from baseline with increases in King-Devick scores; among specific symptoms, light and noise sensitivities were particularly well correlated with worsening performance on the vision test. Baseline scores for the ImPACT testing visual motor speed subscore were also worse for athletes who required longer times to complete the King-Devick test at baseline.

"I do think this is enough to recommend this vision test be used routinely," Dr. Clugston commented. "This test is less subjective than some of the other tests used currently. An assessment of balance is always very subjective, and cognition tests can be too. But the vision test just involves reading numbers from a screen as fast you can. It is very simple and less easily manipulated by the athlete. But it is best used in combination with the standard tests."
In a second paper presented here, some of the same researchers, with first author Priya Dhawan, MD, used King-Devick testing preseason, postseason, and immediately following suspected concussion in 141 high school hockey players. All were assessed before and after the season with a computerized cognitive assessment test (Axon Sports).

Additional testing was performed in a subgroup of nonconcussed athletes before and after a game to determine the effect of fatigue and subconcussive hits on King-Devick scores.

Of the 141 players tested, 20 reported head injury. All of these players had immediate postconcussion King-Devick times greater than 5 seconds from baseline (average, 7.3 seconds) and all but 2 had worse postseason scores (46.4 seconds vs 52.4 seconds; \( P < .05 \) Wilcoxon signed-rank test).

Eleven nonconcussed players had worse postseason times from baseline (37.6 vs 43.8 seconds). One hundred ten players saw minimal improvement postseason (43.9 vs 42.1 seconds; \( P < .05 \)) and 51 nonconcussed players assessed before and after a game revealed no significant time change (43.4 v. 42.0 seconds postgame; \( P < .05 \)).

King-Devick testing accurately identifies real-time, symptomatic concussion in adolescents, the researchers concluded. Scores in concussed players may remain abnormal over time, they note. In addition, the test may detect asymptomatic concussion.

"Athletes should undergo pre- and postseason K-D testing, with additional evaluation real-time to inform the assessment of suspected concussion," Dr. Dhawan and colleagues conclude.

The study was supported by the National Institutes of Health.


How to Tell if a Person Has a Concussion

Determining if an Adult Has a Concussion  Checking For a Concussion in a Child
Edited by Jeffpmil, Devil President, Tillie, Lillian May and 35 others

A concussion can be a serious head injury, but sometimes the severity of the damage is not known immediately. If you fear that you or someone you're with may be suffering
from a concussion, check this list of symptoms and then head to a doctor. With a quick response and a bit of bed rest, recovery from a concussion is almost guaranteed.

Method 1 of 2: Determining if an Adult Has a Concussion

1. **Check for consciousness.** Although loss of consciousness is an easy indication of a concussion, it is not always requisite. Look to see if the person is responsive and can be roused with conversation. If they are unconscious, check their airways, breathing, and circulation to make sure they are all at normal levels.
2. **Analyze their mental state.** If the victim is conscious, you can proceed to this analysis immediately. If they are unconscious, then you will have to wait until they regain consciousness. Someone who has suffered a concussion will exhibit:

- A difficult time concentrating
- Foggy thoughts
- Loss of memory
- Difficulty forming new memories
- A feeling of slowness.
3

Determine their mental awareness. If they seem to be acting strangely and are exhibiting the above symptoms of an altered mental state, ask a few questions to determine the extent of their incapacitation. Try asking general questions such as “what is your name?” and “what day is it?” If they are able to respond promptly and correctly to these, try asking a few more difficult memory-based questions.
4. **Examine their physical state.** Ask them how they feel; sufferers of a concussion often have:

- Nausea or vomiting
- Strong headaches
- Heightened sensitivity to light and sound
- Problems with their balance.
5. **Check the victim's eyes.** If you have a flashlight, shine the light into their eyes. Do their eyes focus on the light and the pupils react correctly? The pupils of the eyes focused completely on light should constrict (grow smaller). If there is no response or they have irregular eye movements, suspect a head injury, stroke, or serious ailment.
Analyze their exhaustion levels. Suffering from a concussion typically disrupts a person’s regular sleep schedule and their exhaustion levels. Check to see if the victim is:

- Very tired and requires more sleep than usual
- Has difficulty falling asleep and insomnia
- Sleeps much less than usual
- Highly lethargic or more exhausted during the day than normal

Look for changes in their emotional state. Sufferers of a concussion will exhibit:

- Strange changes in their emotional state
- High levels of anger, fear, sadness, or anxiety.
- Mood swings and generally unstable emotions.

Method 2 of 2: Checking For a Concussion in a Child

1. Examine their physical state. Check your child for all of the aforementioned concussion symptoms that adults experience.

- Unconsciousness
- Nauseous or vomiting
- Have difficulty staying awake
- Their balance is impaired
- Their pupils do not dilate
2. **Look for changes in their mental state.** In the period shortly after a concussion, there will likely be obvious changes in your child’s mental state.

- They are very sad, abnormally anxious or scared, or throwing temper tantrums
- They have a difficult time focusing or concentrating on anything

3. **Pay attention to their crying.** Because children often get upset when they are injured, regardless of the extent of the injury, it may be difficult to tell if they have a concussion. Paying attention to their crying can help you determine if they are suffering from the brain injury or not.

- They are crying significantly more than a usual injury
- They are abnormally upset in addition to their extensive crying

4. **Watch for changes in their behavior.** In the period of time following a possible concussion, watch your child for strange changes in their behavior.

- They lack interest in doing things they normally enjoy
- Their eating or nursing is different than usual
- They generally behave in a way you would consider unusual
5. **Look out for loss of memory and skills.** Although your child may not be old enough to respond to questions accurately, watch for changes that might indicate they’ve lost memory or the knowledge of how to perform a specific skill. Have they recently been potty trained or taught to hold a bottle, but can no longer perform these activities or no longer seem to know how? Losing the memory of performing a skill can be an indication of a concussion. [3]
Eye movement test assists in diagnosis of concussion
April 14, 2014 8:57 PM

Neuro Kinetics is using high speed digital photography and a software program to diagnose based on how accurately patients track a light pattern from an "optic kinetic sphere."

By Joe Smydo / Pittsburgh Post-Gazette

In research relevant to the gridiron and other kinds of battlefields, Allegheny Health Network and corporate partner Neuro Kinetics Inc. hope to use a new test based on eye movements to bring increased accuracy to the diagnosis of concussions.

The research involves the use of high-speed digital photography and other technology to analyze a patient's tracking of dots of light or other visual stimuli, which are projected against a light or dark background.

In an initial study of high school football players, those with concussions had more difficulty tracking the images than a control group without brain injury. Results of the study will be among the promising developments in orthopedic medicine to be highlighted this month on the website of the American Academy of Orthopaedic Surgeons.
With the Allegheny Health Network's involvement, O'Hara-based Neuro Kinetics now is exploring a potential military application with trials at Naval Medical Center San Diego and Madigan Army Medical Center in Tacoma, Wash.

Mounting concern about the long-term effects of concussions has spawned a flurry of new studies -- including other research at Allegheny Health and at the University of Pittsburgh and UPMC -- on how to better detect and manage concussions.

There currently is no single "confirmatory diagnostic test for concussion," said Jeff Kutcher, director of Michigan NeuroSport at the University of Michigan, who helped to write the American Academy of Neurology's sports concussion guideline.

Unlike broken bones, which show up on X-rays, or other conditions that can be detected through imaging, concussions are not readily observable. While doctors, athletic trainers and professionals have balance and cognition tests to guide them, diagnosis of concussions still relies partly on the self-reporting of athletes who may just want to return to the game.

To some degree, "you are relying on patients telling you how they feel," said Sam Akhavan, a sports medicine specialist at Allegheny General Hospital who's involved in the research of the Neuro Kinetics technology, called I-Portal.

J. Howison Schroeder, Neuro Kinetics president and CEO, said he hopes I-Portal will be more clinically precise than methods now used to detect concussions, including the well established King-Devick Test, a 2-minute eye-movement test that measures the speed and accuracy with which a person reads a sequence of numbers. Eye-movement tests, including King-Devick, also are used to assess people for multiple sclerosis, Parkinson's disease, dyslexia and other disorders.

Concussions are a major concern for the military, whose soldiers can sustain the injury in combat, and for sports at the scholastic, college and professional levels. The National Football League faces a lawsuit from more than 4,000 former players who claim they weren't properly warned about, or treated for, concussions. A judge last year rejected a proposed $765 million settlement, saying she didn't believe the sum was sufficient.

In the I-Portal trial, researchers administered the eye-tracking test to 292 high school football players with no record of brain injury. Ten of those players later sustained concussions that were diagnosed by the standard methods. When they were given the eye-tracking test again, the 10 performed at a significantly lower level than they or their peers had before.

"They fell well outside what the normal fit was," Dr. Akhavan said.
Dr. Kutcher and Steven Broglio, director of the University of Michigan’s NeuroSport Research Laboratory and lead author of the National Athletic Trainers’ Association policy on concussions, said I-Portal is less likely to be the magic bullet for diagnosing concussions than another tool health professionals will have available to them. To increase the accuracy of concussion detection, he said, some professionals use multiple tests on a patient.

The companies owning the King-Devick Test and Oakland-based ImPACT -- which measures attention span, memory, reaction time and problem-solving ability -- do joint marketing. Both products have a list of studies backing up their reliability, but neither considers itself a stand-alone diagnostic test. James S. Gyurke, chief marketing and sales officer for ImPACT, said his team is among those searching for improved measures of concussion detection.

Besides the I-Portal research, Allegheny Health Network is helping to evaluate a test, developed by a Cleveland Clinic Innovations spinoff, that incorporates a patient’s vision, balance and motor function into concussion detection.

Awarded one of 16 NFL-General Electric grants in January, UPMC is working on the development of a new imaging technique that would show concussion damage. Other grant recipients are working on other imaging techniques and blood tests.