Hey Coach:
Are Concussions Really "Brain Injuries"?

By David Bourque – April 4, 2016

Yes, concussions really are brain injuries.

I write this article from a deeply personal perspective. My 28 year career as a clarinetist in the Toronto Symphony Orchestra ended in 2011 due to ongoing symptoms of a severe concussion-related brain injury. My injury was caused by a motor vehicle accident in 2008 and it was not the first concussion I had suffered. I, like most anyone who plays recreational (even non-contact) hockey, had sport-related concussions. This was also not my first trip to the motor-vehicle-accident-dance: it was my third major accident since 1983. I had a concussion in each of these accidents.

Although public understanding of the dangers of concussion are better now than ever before, there remains a disturbing amount of misinformation disseminated by people who should know better. I have heard sports journalists and coaches using the phraseology that 'the doctors are examining a player after severe blow to the head to see if he is concussed'. Nonsense. The player has a concussion and the damage is only a matter of severity.

Many coaches do not understand that a concussion is a brain injury. They need to learn this and they need to call it what it is.

A Concussion Is A Traumatic/Acquired Brain Injury

Many doctors call concussions a *traumatic brain injury* (TBI) or *acquired brain injury* (ABI). Some doctors are now referring to TBIs and ABIs as 'concussions' as that is the term commonly used by the public. But in my opinion, the use of the term 'traumatic brain injury' or 'acquired brain injury' more definitively relays the dangers of a blow to the head in a more visceral way. I feel that using the term 'concussion' instead of 'brain injury' dumbs down the conversation. The term 'brain injury' sounds very serious and that's because traumatic/acquired brain injuries *are* very serious.

Losing Consciousness Is Not Requisite To Damage The Brain

One of the many falsehoods surrounding this discussion is that some believe a loss of consciousness is requisite to suffer an acquired brain injury/concussion. *This is not true*. Another falsehood: if there are no symptoms immediately after and shortly following the blow to the head, then the injured is free and clear of a traumatic brain injury/concussion diagnosis. *This is also not true*. In my case, I was not aware of symptoms until weeks after my accident. It was only then that I began to realize the severity of my brain injury. I

unknowingly compounded the problem by trying to return to work at the Toronto Symphony. My brain needed to rest and heal, and I unknowingly interfered with this process and extended my recovery by taxing the brain at a sensitive time.

It is important to note that a traumatic brain injury *can be diagnosed without the injured experiencing a loss of consciousness*. It is also important to note that there can appear to be no external damage, not even a bump or bruise on the skull, but nonetheless a very serious brain injury may have occurred. This is often the case in a motor vehicle accident where the head strikes nothing.

The Injured Looks And Seems Fine – They Are Anything But Fine

Other myths of traumatic brain injury are perpetuated by the observation that the victim "looks and seems fine". A person who has experienced a severe blow to the head is anything but fine. This "uninjured appearance" often plays against the victim filing a claim for disability benefits under a group insurance policy. It certainly did for me as my claim was rejected and I was without income for one year despite mounds of anecdotal and medical evidence documenting my traumatic brain injury.

Causes Of Traumatic Brain Injury
Are Often Misunderstood By Non-Medical Professionals

The causes of acquired brain injury/concussions are always the same - a blow to the head, neck or body or a violent motion of the head without a blow. The symptoms vary wildly between victims. The severity of a traumatic brain injury/concussion can be measured in part by the force and direction of the insult or blow to the head. An acquired brain injury/concussion can even occur if the head suffers no direct blow, but rather is jerked violently in one direction.

Many think that the blow is the direct cause of the injury. *This is not the case*. It is the movement of the brain inside the skull that is the cause of the injury.

The Laws of Inertia Cause the Brain Damage

The brain is suspended inside the skull. When a sharp blow to the head occurs, the skull moves violently in the direction of the blow while the brain remains at rest - Newton's First Law of Motion. The inside of the skull then strikes the stationary brain with the same force delivered outside the head. It is this – the skull striking the brain – that causes much of the damage.

But the damage rarely ends with that single blow. After the initial blow/rebound, the brain bounces off the inside of the skull and strikes the other side of the interior of the skull with a force generally equal to the initial blow. This is why the secondary consequences of a blow to the skull often include injury on opposite sides of the brain – a bilateral brain injury or a *coup-contrecoup*.

The brain can bounce multiple times in this way, each time damaging the brain in a different spot. Rotational forces are probably worse than linear as the brain can be twisted around its stalk, as it were, the brainstem.

Do Helmets Provide Protection from Concussions?
Helmets may prevent skull fractures and they may lessen the severity of the blow by the time the force gets through the helmet and impacts the skull. However, helmets *do not* prevent acquired brain injury/concussions. The belief that a player is fully protected against acquired brain injury by using a helmet is folly.

What About Violent Impacts And Forces In A Motor Vehicle Accident?
The forces in a motor vehicle accident are huge. They are much greater than the forces in a contact sport. This is due in part to the speed of the collision and weight of the vehicle – Newton's Laws of Motion apply. In the case of a motor vehicle accident, the brain hits the inside of the skull multiple times as the vehicle hits other objects after the initial impact, spins or rolls over.

The car takes a long time to stop moving and with every change in direction of the spinning or rolling car, the brain hits the inside of the skull and there is brain damage. The brain can be sloshed about inside the skull, the forces of the accident causing the brain to change shape almost like the wringing out of a sponge. This type of brain injury is considered to be more severe than a concussion. It is known as a *diffuse axonal* injury. It is the same type of trauma that occurs in the brain of a baby who is a victim of baby-shaking.

Violent motion of the brain in this way will result in not only a concussion, but actual bruising or contusions of the brain. Large contusions may need to be surgically removed in order for the victim to recover or even survive.

Some of the damage caused by the secondary blows can minimal, but some can be severe. Though I had no evidence of contusions, I had extensive damage to my brain after my accident in 2008. My brain was wrung out like a sponge.

Symptoms & Recovery Vary Greatly Between Individuals
Many know of the most common symptoms of a traumatic brain injury/concussion: headache, dizziness, onset of depression, being 'in a fog', memory loss, excessive fatigue.

My symptoms were devastating to my elite artistic ability. The Toronto Symphony is a superb, high-level orchestra in a class with the great symphony orchestras of North America. After the injury, I was no longer able play clarinet in the TSO at the consistently high level that was required. Some days, I could not remember clarinet fingerings – stuff I have known since Grade 9. Other days I could play in the right key OR the correct rhythm, but not both. I have heard a

neuro-psychiatrist call this a ‘loss of executive function’.

Some days, I could not remember very good friends’ names. I was ‘in a fog’ for all of the first four months after the accident and much of the next year. I could not participate in conversations or, on some days, even follow them. As I recovered, the fog dissipated for one day, with a return to the confused state. The non-fog days per week grew to outnumber the fog days as my brain healed over the next year.

A year after the motor vehicle accident, I was recovering well. Unfortunately, I suffered a second blow to the head shortly after the one-year anniversary of the motor vehicle accident. This secondary injury imparted much less force than the original motor vehicle accident (this time I banged my head on an open cupboard door), but the symptoms returned and were greatly worse. Secondary (and lesser) damage on top of an unhealed concussion can vastly extend or arrest the healing period, as it did with me.

The Damage Caused By Acquired Brain Injury Is Cumulative

While it is not possible for me to say with certainty, this may be what happened to Sidney Crosby when he experienced his brain injury. He was hit hard in a game and only a few days later he was hit again, this time with much less force. He suffered a concussion, or more accurately a TBI or ABI. It took a full year game for his brain to heal before he returned to the ice. It is possible that after the brain injury, Crosby’s remarkable gifts on the ice - his vision of the ice, his creativity - were compromised as a result of a loss of executive function.

It is gratifying to see him play at a high level once again. I know that my series of concussions culminated with my inability to play at a high level. It is very possible that Crosby’s (or any NHL player) series of ABIs will accumulate the damage making the next one more consequential than the last.

While Crosby returned to the NHL after a year, it can take a number of years for the symptoms to become more manageable and they may never disappear completely. It took me a full five years for a return to “almost normal”, but I am still healing. Even though my recovery is going very well, I still cannot play the clarinet at an elite level, nor will I ever be able to do so again.

The Ongoing Spread Of Misinformation

Over the past two months alone, I have heard multiple sports broadcasters and print journalists (reporting or play-by-play of NCAA Football, NFL, NHL) demonstrate a shocking lack of understanding about an injury so commonplace in the sports on which they report.

Some recent comments by professional sport coaches were born by a lack of

understanding of traumatic brain injuries. They continue to be dangerous and misleading. These comments do not serve toward the better understanding of traumatic head injures by the public. As professionals in a contact sport, coaches at the college and professional level should be much better informed.

A few years back, an NHL defenseman took a puck to the middle of his forehead and broke his forehead bone. The general manager of the team was heard later in a press conference dismissing a question from a reporter about the player having a concussion or brain damage. He scorned the words "brain injury" implying that that term was "a bit much" for the scenario. In fact, "Brain injury" were the words that would have been most appropriate given the damage to the player's skull: it would have been impossible that this player did not have some level of brain injury as a result of this severe blow and damage to his forehead.

The idea that an athlete is "tough and will suck it up", declare himself fit to play and be back in a game after a brain injury is shortsighted and dangerous. One of the many things than can result from a traumatic brain injury/concussion event is an injured person's lack of awareness about his own self and wellness. After a blow to the head, the injured player is the last person who should have the final say about when to return to a contact sport– be that in a day, that week, that month, that year…

As a 'concussion' *is* a 'brain injury', media and print journalists can help us to understand the serious nature of concussions by starting to use the term 'traumatic/acquired brain injury' instead of 'concussion'. Perhaps the use of the medical term will enlighten more sports professionals, journalists and the public to the seriousness and dangers of traumatic/acquired brain injury.

Thankfully, the brain is a remarkable organ. Given a chance, it will often repair itself, but it will do so on its own schedule. It may take weeks, months or in my case, years to repair. It will take longer if the brain is not allowed to rest while it undertakes its self-repair. If there is a subsequent blow to the head while the brain is healing after the first traumatic/acquired brain injury, this may drastically slow down or even obstruct full healing of the damaged parts of the brain.

David Bourque played clarinet and bass clarinet in the Toronto Symphony Orchestra from 1983-2011. His orchestral career was ended in 2011 largely as the result of a traumatic brain injury suffered in a serious motor vehicle accident in 2008. It took until 2013, five years after the accident, for the symptoms of his brain injury to become manageable. Although his health is much better, David still has concussion-related symptoms to this day. While David is not a medical doctor, the observations of his symptoms and his research to discover reasons for them provides the basis of this article.