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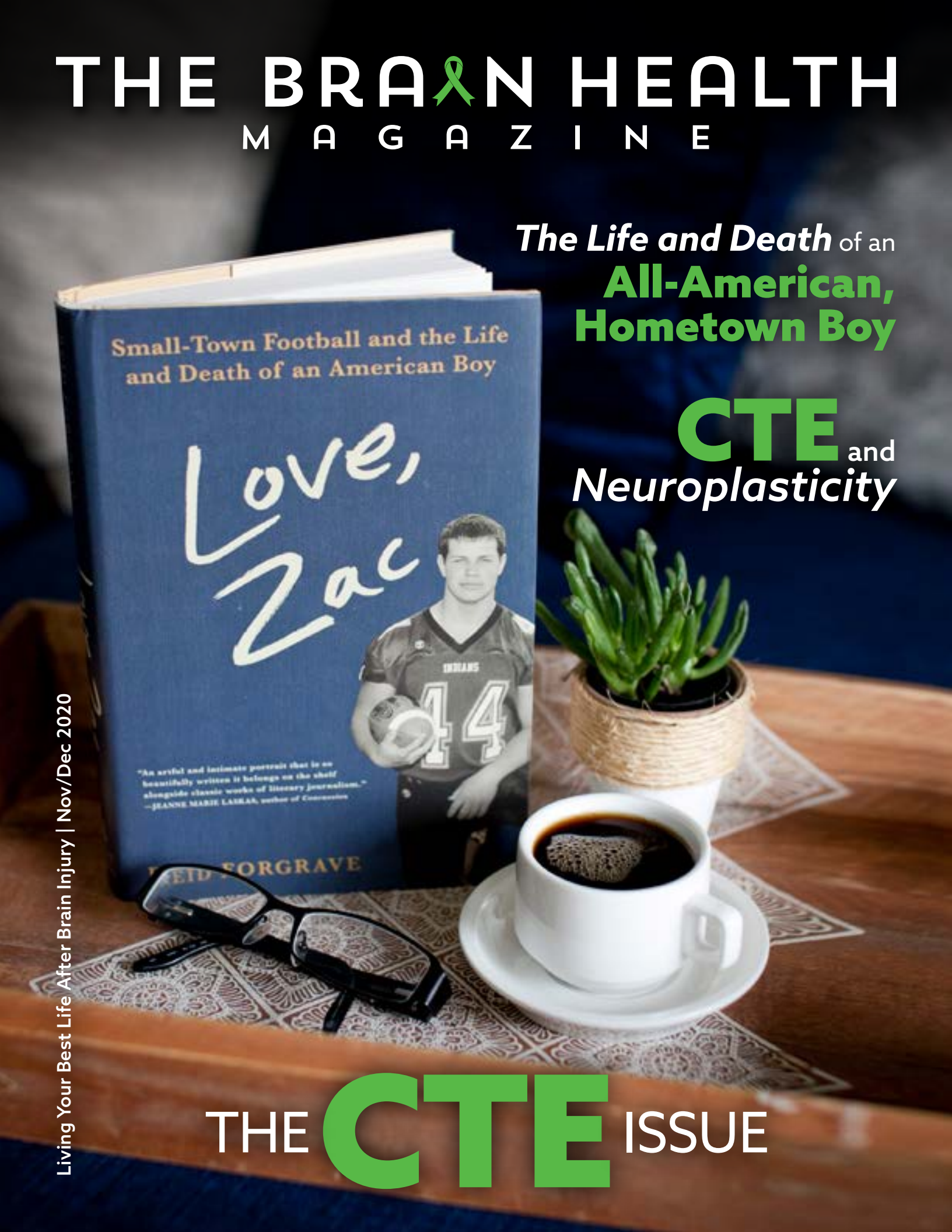

The Life and Death of an **All-American, Hometown Boy**

CTE and *Neuroplasticity*

Living Your Best Life After Brain Injury | Nov/Dec 2020

THE **CTE** ISSUE

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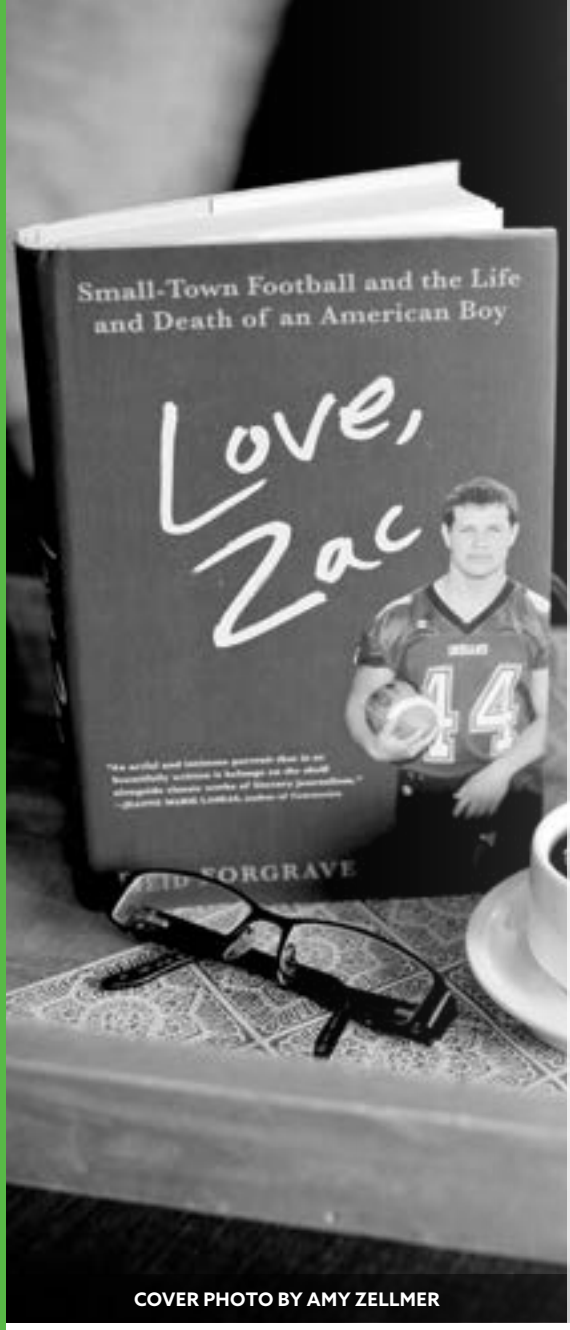

COVER PHOTO BY AMY ZELLMER

Contents

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Meeting Bennet Omalu

**AMY ZELLMER,
EDITOR-IN-CHIEF**

This issue is all about CTE — chronic traumatic encephalopathy —. the progressive degenerative disease of the brain found in people with a history of repetitive brain trauma, most notably football players. One of the doctors at the forefront of the discovery of the disease was Bennet Omalu, who was portrayed by Will Smith in the movie *Concussion*.

I had the pleasure of meeting Dr. Omalu in 2016. Below is a snippet from my blog recounting the meeting.

"Last night I had the experience of a lifetime, meeting Dr. Bennet Omalu at the Beth El Synagogue here in the Twin Cities!

Omalu is portrayed by Will Smith in the movie *Concussion*, which is a true story of Dr. Omalu and his journey in discovering CTE and taking on the National Football League (NFL) over the dangers of repetitive head trauma.

I was able to shake his hand and have him autograph a book for me. His smile is genuine, and he has a laugh that can make even the Grinch smile!

Throughout the evening he commented on how we are intelligent Americans, and intentionally hitting our heads in a game is just not intelligent. There are many false assumptions that simply wearing a helmet will help prevent head injuries … even though we know this is not true as we watch NFL players repeatedly endure concussions.

He also addressed the issue of youth sports, and that it is our responsibility to ensure their safety. We do not allow children to smoke until 18, drive until 16, drink until 21 … yet we allow them to endure repetitive head trauma as young as 8 years old. Where is the intelligence in this thinking?

Bennet is a dynamic and passionate speaker, and I am so blessed to have had the opportunity to hear him speak."

Since meeting him, I have also had the pleasure of interviewing him on my podcast ("Faces of TBI," available on iTunes, Spotify, iHeart Radio, and most streaming platforms). Dr. Omalu is passionate about helping parents understand the risks involved in contact sports, and understanding that a helmet will not prevent a concussion.

While CTE is most commonly found among athletes, it's important to understand that suffering a brain injury doesn't have to be a life sentence. There are providers out there that can help you, and steps you can take to help protect your brain, even after a concussion. Find a Functional Neurologist near you (see my doctor guide at www.facesoftbi.com/resources) and learn more about ways to reduce inflammation and get you back on track to feeling yourself again.

Peace and glitter,

4 Things *That Most Concussion Patients Should Worry About More Than CTE*

BY JONATHAN CHUNG, DC

Chronic Traumatic Encephalopathy (CTE) has played an important role in bringing awareness to the long-lasting problems associated with repetitive head injuries. The high-profile deaths and autopsies, like NFL linebacker Junior Seau's, have put contact sports under the microscope as public concerns about concussions have increased dramatically.

The heightened public awareness and scrutiny have created some major positive changes. Professional and amateur sports organizations are taking head injuries more seriously. Every sport now has specific concussion protocols. The days of an athlete getting knocked unconscious and being put back into the game the same day have almost become a thing of the past. The heightened awareness has also led to an explosion in research on traumatic head injuries, which are leading to more effective management strategies for concussion.

While most changes have been positive, some downsides come with greater public awareness of medical issues. In recent years, we have more patients and parents who have become hypervigilant about the effects of concussion. When patients become hypervigilent, there are higher risks for psychosomatic symptoms by a nocebo effect that can lead to prolonged symptoms. Some parents are so worried that a concussion will inevitably lead to CTE, they are stopping their kids from playing sports.

Let me be clear: Anytime someone has a concussion, it's a serious injury. We shouldn't take any trauma to the brain lightly. But here is the reality about most concussion injuries: The vast majority get better without any outside help or intervention. Upwards of 85% of patients will have symptomatic resolution of their injury within 30 days.

And CTE? The jury is still out about concussion and CTE. Since concussion research has exploded in the past 20 years, so has CTE research. The pathology that makes up CTE has been found in some autopsies without any recorded history of head injury or repetitive head contact. There's also been CTE pathology in the brains of patients who didn't have any reported CTE symptoms.

The majority of evidence suggests that when CTE pathology gets out of hand, it can cause severe psychological and neurological problems. It also appears that most cases are related to occupations that feature a lot of repeated head contact.

What does that mean for you if you've had one or even a few concussions? We don't know anything for sure, but it doesn't seem like CTE is going to be high on the list of expectations.

There are some things that you SHOULD be concerned about if you've suffered a concussion.

Here are my top four:

1. *Outdated treatment recommendations: Twenty years ago, we used to believe that patients with concussion should rest their brains until their symptoms went away. It was called cocooning. In the last 10 years, the best evidence suggests that this is the wrong way to treat a concussion patient. We now know that early use of controlled exercise and activity appear to improve recovery significantly compared to strict rest.*

   But like all things, it takes time for research to translate into practice, and many doctors still prescribe strict rest because they are not caught up on current evidence.

2. *Cervical injuries: Neck injuries are really common after a concussion, but are often not acknowledged or treated. Recent evidence has shown that neck injuries with concussion leads to delayed recovery. We also know that injuries to the neck present with similar symptoms to concussion, and have a higher likelihood of prolonged symptoms.*

3. *Vestibular/Ocular Dysfunction: Concussions commonly affect the areas of the brain responsible for balance and eye movements. Injuries to these areas can leave patients with symptoms of dizziness and imbalance, but can also have profound effects on cognition. This is why vestibular therapy has become a standard part of concussion management.*

4. *Sleep and Mental Health: Patients who suffer concussion are much more likely to report major depression or post-traumatic stress disorder compared to patients with major orthopedic injury. Mental health issues may also be a factor in sleeping problems. Concussion patients are 30% more likely to have a sleep disorder such as insomnia, daytime drowsiness, and sleep apnea.*

We should all worry about our future brain health because it is the only one we'll ever get. However, it's not the main thing a current concussion patient needs to obsess about. There are enough problems associated with a concussion that are impacting your life right this moment, and the good news is that many of these things are very treatable.

Jonathan Chung, DC, *is the founder and upper cervical chiropractor at Keystone Chiropractic and Neuroplasticity in Wellington, Florida. Learn more about their cervical vestibular rehabilitation program at* ***www.chiropractickeystone.com***

Can **Specialized Neuro Glasses** Help Traumatic Brain Injuries from Concussions?

BY DR. TERRY TRINKA

The short answer is, Yes! And here is how they work.

In a concussion or traumatic brain injury, the impact causes your brain to slosh around inside the skull, damaging the finely wired circuitry.

While many people recover within three months of a hit to their head, a good percentage do not. Those people need specialized care.

How easily you recover is affected by factors other than the intensity of the impact to your head. Are there pre-existing problems with your health that affected your brain prior to the impact? Has your rehab process addressed your visual system's circuitry to the level needed?

Since the visual system provides 70 to 80% of the sensory input into your brain and connects with almost every other part of your brain, damage to this circuitry can have far-ranging symptoms including dizziness, balance issues, reading problems, fatigue, lack of concentration, language deficits, memory issues, and headaches/migraines.

Many of these symptoms arise because what your eyes are seeing is mismatched with what your brain is interpreting due to the damage caused by the concussion.

Another good reason for these symptoms is that the damage from the concussion affects the parts of your brain that control eye muscles. Without the ability to accurately move your eyes and create a stable image on your retina, you have a vastly greater chance of a mismatch between the signals your eyes send to your brain and how your brain interprets those signals.

The goal of neuro glasses is to correctly match your retina with the other sensory systems in your brain. This can alleviate many symptoms.

Specialized neuro glasses can send light to specific areas of your retina that in turn stimulate parts of your brain. Traditional optometry seeks to create a clear image for your central retina so you can see detail.

I look at your peripheral retina and its connection to your central retina and your brain. This is a critical connection for concussion and TBI recovery.

The two most common areas injured in a concussion are the base of your brain, called the cerebellum and the parietal lobe where all of the senses are integrated. The cerebellum coordinates muscle activity for voluntary movements and enables fine muscle adjustments to maintain balance.

Targeting these areas of your brain often resolves many symptoms of concussions.

The tools involved in the making of neuro glasses involve lenses, prisms, tints, and occlusions. Each one of these tools can expand or contract your visual perception in order to better match the signals coming in from the rest of your senses.

In addition, neuro glasses can help normalize eye movements that affect posture, gait, balance, and coordination, although they can do much more than that.

By using these tools and subsequently modifying them as new neural connections develop, along with brain-based activities and metabolic help, you significantly increase the likelihood that you can fully recover from a concussion.

Dr. Trinka *is a neurological optometrist and a member of NORA (Neuro Optometric Rehabilitation Organization) who uses his neurological background to help people with concussion and brain injuries. He is passionate about educating people about the details of the eye-brain connection in order to guide them through the process of balancing and rebuilding vision-brain function.*
www.eyebrainconnection.com

CTE, TBIs, & Psychotherapy

BY JACOB MEYER LSW, LAC

Our understanding of Chronic Traumatic Encephalopathy (CTE) has changed the public's understanding of the behavioral and emotional impacts of multiple symptomatic or asymptomatic traumatic brain injuries (TBIs). With CTE being diagnosed postmortem, this article will focus more on people understanding behavioral and emotional changes seen in TBIs from a psychotherapeutic perspective.

Knowing the symptoms

The common symptoms associated with CTE and TBI are impulsivity, aggression, irritability, depression, suicidality, cognitive issues, anxiety, fatigue, sleep issues, and headaches. A person suffering from chronic symptoms of TBIs will also typically struggle with a prolonged recovery process and continued distress from unknowns in their ability to fully return to their sense of normalcy. It's important to note that these issues do not happen one at a time. Symptoms can often co-occur, cluster due to stress, and be confusing in their presentation. This can be especially distressful for the person experiencing them due to a lack of coherence in their presentation, along with the intensity of symptoms.

Assessing the impact

The impact of symptoms from chronic head traumas can be devastating to the overall life of someone experiencing them and their immediate relationships. Some special considerations are the lack of understanding of TBI recovery, the lack of a physical signal of recovery, such as a cast, and the significant impact on the person's ability to handle cognitive load in daily life. The negative impact of symptoms from TBI recovery are a severe decline in the ability to work, begin new relationships, maintain old relationships, distress of the immediate spouse and family system, and impulsive behaviors that can result in the person feeling like they are "losing themselves." The immediate and long-term impacts are typically debilitating, but it is also common to see the impact of previous traumatic experiences and TBI recoveries. The person's ability to regulate themselves typically is diminished when the significant stressors they experience allow for previous traumatic events to come back to the surface. These impacts can lead to a feeling of further loss of self and a sense of permanence in the changing quality of life the person is undergoing.

Treating the whole patient

When a person comes in with significant issues from head trauma it is important that they find ways to create stability in their emotional regulation skills in the short term. Often, a person experiences significant emotional dysregulation in their day-to-day life that can be debilitating in itself. It's important for the person to build back some of their sense of self through an increased ability to navigate through debilitating symptoms. When this occurs, the person can look toward unpacking distressing emotional content with more confidence that they will be able to regulate themselves in between sessions. This is important because individual psychotherapy, when done properly, is a stress in itself. We need to be able to recover and manage this stress just like we manage working out, not too much but not too little, so we will be able to grow effectively over time. Once the base of emotional regulation is there, the person can work toward targeting more of the specific symptoms that are causing them emotional distress, such as older traumatic experiences and significant lifestyle and relationship changes.

It's important for people to understand that the impacts of TBIs that lead to CTE are debilitating and life-threatening. Psychotherapy can be a pivotal tool in recovery or symptom management to help the person feel more empowered and free within their life.

Jacob Meyer, LSW, LAC, *is experienced in working with patients who are experiencing chronic pain, chronic illnesses, TBIs, autoimmune issues, anxiety, depression, trauma, addiction, perfectionism, and relational dysfunction. Jacob is passionate about helping his patients become stronger through the therapeutic process and understands that issues present in ways that are unique to every individual. Jacob works to help you find your way through what you are experiencing, and on to a path that you want to take.*
www.integratedbraincenters.com

Submitted Photo

The Life and Death of an All-American, Hometown Boy

BY AMY ZELLMER, EDITOR-IN-CHIEF

> **“He had only played high school football, and yet was struggling every single day from the effects of repetitive hits to the head.”**

With the release of the book *Love, Zac: Small Town Football and the Life and Death of an American Boy* by Reid Forgrave, we are given an intimate look inside the diaries and journals of Zac Easter, who was convinced his increasing mental health issues were because of CTE, the result of multiple concussions he suffered as a high school football player.

I had the opportunity to sit down with Ali Epperson, a longtime friend of Zac’s and a founding member of CTE Hope. Ali and Zac were best friends for about five years, and had an off-and-on romantic relationship. The last year of Zac’s life, Ali was away at college and then law school, yet they were the closest they had been in their relationship. Instead of continuing off-and-on, Ali and Zac decided to fully commit to an exclusive relationship and finally made their “behind the scenes” relationship public.

The day Zac took his life, he and Ali had been hanging out all day at her house. She took him home and he was planning to get a haircut before they went out to dinner that evening. He canceled dinner plans on her, saying he wasn’t feeling well, and she went out with some friends. They continued to text throughout the evening. Shortly after midnight his texts started getting serious. When the last text he sent her was written in past-tense, she knew in her gut that something was happening so she called his family.

He was already gone. He was only 24 years old.

He left behind a hand-written note as well as a few things for them to find, including his notebooks and journals.

A month earlier, he had threatened suicide, but they had been able to talk him down. He admitted to Ali that he had thought seriously about suicide, but didn’t go through with it on numerous occasions. He was open with her that he didn’t see the point of living because he could never be fixed or get better. He was struggling every day and had a lot of ups and downs.

“[H]e wanted everyone to raise awareness about CTE. He wanted them to talk about mental health, and how to make sports safer. He wanted to shine a light on CTE and help others going through the same journey know that they’re not alone.”

Ali and Amy at the CTE Hope Gala in 2018

Zac had told Ali about his fears of CTE and the struggles that he had been dealing with. He had mentioned he was going to try to write down things every day about how he was feeling, and what he learned at doctor appointments. A few months before his death, he told Ali he was writing a longer life story narrative and that he wanted her to read it eventually. He really wanted to get it all down on paper, and the reasons became even clearer after his death.

He requested that his brain be studied so that it could help others and help with research efforts. He had only played high school football, and yet was struggling every single day from the effects of repetitive hits to the head.

He also made it very clear that he wanted everyone to raise awareness about CTE. He wanted them to talk about mental health, and how to make sports safer. He wanted to shine a light on CTE and help others going through the same journey know that they're not alone.

Ali commented, "I've always thought that while I am devastated Zac is no longer here, it was in part an act of bravery because he wanted to help others who are suffering and the only way he knew how to do that was to have his brain studied and his journals out there. He didn't want others to suffer, and wanted them to know they're not alone.

"I think he did it for a purpose and unselfish reasons. He didn't know who he was anymore. Before he lost every semblance of himself he wanted to die still knowing who he was. I think it would be selfish of me to have said 'You have to stay on this earth for me.'"

CTE Hope was established to fulfill Zac's wishes. Made up of his family, Ali, other friends, and Zac's high school athletic trainer, CTE Hope's mission is to provide education and awareness, and support the research, diagnosis, management, and treatment necessary to protect individuals from the long-term effects of head traumas and concussions that can lead to CTE.

Their main effort currently is saliva research to develop into a point-of-care device for sidelines and ERs — a test that can tell from a physiological standpoint if someone has suffered a concussion by measuring the biomarkers in their brain. While the testing is currently on hold due to COVID, they are hopeful that this testing will help prevent future players from CTE.

They are continuously trying to develop resources and referrals for survivors and caregivers, and to stay up-to-date on new research and published articles on CTE. They are also hoping to develop a support group for both survivors and caregivers.

In the newly released book, Forgrave was given access to all of Zac's diaries and journals, as well as his family and friends. The core of the book is Zac's story, but it is also about the history of football and how it is so ingrained in our society. It talks about the science behind CTE, and includes interviews with the doctors who treated Zac, as well as his football coach and athletic trainer.

"From the beginning, our number one reason for wanting this book written was because Zac wanted his story out there to raise awareness, and understand as best they could what he went through, what happened to his mind and brain that led to his death. All the efforts will lead to more support, resources, and research that can help create detection and management [of CTE]," stated Ali.

"The most powerful thing about this book is that while you can never be inside his mind, this is as close as we can get to hearing his words in real time as he was going through this."

Ali remarked that the book is "relatable on so many levels beyond Zac." She went on to say that people are so conflicted about concussions and CTE in football because it is such a large part of our society, and brain injuries are still so unknown — even to doctors. The book asks "Where do we go from here?" While it doesn't give us answers, it gives us a lot to think about.

BY SHAUNA HAHN

Transcranial Magnetic Stimulation

After two brain injuries, the most recent from a motor vehicle collision in 2015, 67-year-old Margaret despaired, saying,"I can't keep living like this." She was severely depressed and extremely anxious. She could barely leave her house and second-guessed even the most banal of social interactions. She was taking a high dose of Lexapro, lithium orotate, and various anti-inflammatory supplements, and seeing a talented therapist, but she could not shake her awful mood. She was often irritable and afraid, and feared she was alienating those closest to her. She had been seeing a functional neurologist and had great success functionally but her mood was another story. So she decided to try transcranial magnetic stimulation, or TMS.

TMS utilizes an MRI-strength magnet, a 1.5 Tesla (electromagnetic) coil, that is placed directly on the skull and transmits an electromagnetic signal through the scalp, skull, and about 2.5 to 3.5cm deep into the cortex and connects to other brain structures that we know are implicated in depression, anxiety, trauma, and brain injury.

Prior to using a magnet to induce electricity, a direct electrical current was used, but it caused discomfort. TMS is much more precise. The TMS magnet fires into an area called the left dorsolateral prefrontal cortex (DL PFC) an area rich in terms of its connectome.

TMS is not a new technology. First invented in the mid-1980s, the FDA approved it for treatment-resistant major depressive disorder in 2008, and more recently for obsessive compulsive disorder. As part of our integrative practice with Northwest Functional Neurology, we offer TMS for our patients who experience various neurological problems, including recovery from brain injuries.

The brain is a complex series of networks. Three that are very important in anxiety, depression, trauma and TBIs are the default mode network, (DMN), the salience network, and the executive network. The default mode network is what some people describe as being as close to a neuroanatomic description of "the seat of consciousness" as we have. It is the neurological basis for the self. It is our autobiographical information and includes memories of collection of events, facts about one's self, and self-reference. As I often say, when you wake up in the morning and you look at your ceiling fan, you don't have to think about who you are, you already know. You know coffee or tea. You know that annoying boy you went to fourth grade with. You know that person you had a crush on in college. You don't have to "onboard" that information each day . It's there with you at rest, which is why, some alternately refer to the DMN as the "resting state network."

The DMN is most active when the brain is at rest or involved in social communication. In "healthy" people, its activity is attenuated during the performance of cognitively demanding tasks. That is, our salience network (salience meaning "important noticing") can take us from a delightful mind wander to our "business brain," where we are solving problems, paying attention, and making decisions. What happens in anxiety, depression, trauma, and brain injury, though, is that SN cannot handily move us from our restful brain to our working brain and it over-accentuates painful aspects of ourselves such as negative characteristics or painful memories. It keeps patients stuck in a loop of misery because it cannot easily switch over to the problem-solving part of our brain. TMS directly targets the executive network and the salience network to help get those brain structures working properly!

Although we do specialized treatment at Framework Functional Psychiatry and TMS (Northwest Functional Neurology), most of our patients benefit from "treatment as usual" and using the left DLPFC as our treatment target. Medical research has shown that the DMN is typically disrupted in TBIs.

Margaret completed the standard 36 TMS treatments and began to achieve results — both in terms of mood and congnition — as early as week two. She first feared that it wasn't real. "Maybe it's just a placebo," she said. She continued to improve and finally wrote this in her correspondence for Christmas 2019: "Well, it's been a long hard haul I say as I look back on these two head injuries phase of my life since 2015, but this afternoon I note a rather large yet subtle change in myself that is — miracle of miracles — seeping through the darkness, the parts of me that had disappeared, that I had forgotten ever existed, like my memory, my personality, my vitality, joy, words, perception, energy, and on and on. I knew I wasn't myself and I had no capacity to access what I couldn't even remember. I'm so happy to see my old familiar self make an appearance. She reminds me of all the people I love and have felt connected to throughout my life!"

Shauna Hahn *specializes in the treatment of post-brain injury psychiatric disorders and often lectures on this topic. Shauna is excited to bring her expertise to TMS at her beautiful destination clinic, Framework Functional Psychiatry and TMS, in Lake Oswego, Oregon.* *www.frameworktms.com*

Chronic Traumatic Encephalopathy

BY JAMES A. HEUER, PA

Chronic Traumatic Encephalopathy (CTE) is a degenerative brain disease associated with a history of repetitive brain traumas. Repeated, forceful blows to the head are the greatest risk factor in the development of CTE. Researchers and physicians have only begun to understand, therefore more time and research is needed to fully understand the symptoms of CTE.

CTE is compared to similar conditions, such as Alzheimer's disease and Parkinson's disease. Based on the present research, these conditions involve the loss of a substantial number of brain cells. In CTE, a protein forms clumps around the brain and spreads slowly, eventually killing brain cells. Signs of CTE are:

- *Memory loss*
- *Confusion*
- *Personality changes such as depression*
- *Erratic behavior such as aggression*
- *Problems paying attention and organizing thoughts*
- *Difficulty with balance and motor skills*

Traumatic brain injuries can be moderate to severe and the symptoms can vary with the length of unconsciousness from the brain injury. A mild traumatic brain injury causes short-term symptoms that usually appear at the time of the injury, but also can occur days or weeks later.

Concussions and TBIs suffered in the sport of boxing have been attributed to CTE. CTE was first described as "punch-drunk syndrome." Boxers who suffer many repeated blows to the head that do not cause unconsciousness may be at an increased risk of CTE. This is due to the fact that CTE in boxers is linked to the number of blows to the head, not the number of times the boxer was knocked out.

This evidence concludes that CTE is caused by repetitive hits to the head happening over a period of years, not a handful of concussions. The best possible evidence suggest that sub-concussive impacts, or hits to the head that don't cause full-blown concussions, are the biggest factor. It may take thousands of hits to the head over years and years in playing contact sports such as boxing or football.

Research has shown that the length of exposure is found to be a dependent variable in developing CTE as it poses a greater risk in football players. CTE risk is correlated with length of career, as athletes with longer careers are more likely to have more severe pathology than those with shorter careers.

As of now, CTE is only diagnosed through post-mortem brain tissue analysis. Currently, there is no test that can determine if a living person has CTE, so the autopsy after death is the only opportunity for diagnostic testing. There is no treatment or cure.

Simply put, the only way to avoid getting CTE is to prevent getting repeated injuries to the head. As previously noted, CTE is similar to Alzheimer's disease; caring for someone with the diagnosis can be overwhelming as it progresses. With the evidence we have available, we can conclude that CTE mimics the symptoms created from a TBI. There are several ongoing major research studies that are gaining further insight into the injury patterns and changes in the brain affected in CTE.

James A. Heuer, PA *is a personal injury attorney helping individuals with TBI after suffering one himself. He is located in Minneapolis, Minnesota.*

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CTE & NUTRITION

BY DR. LORI JOKINEN

With growing amounts of research on concussion and chronic traumatic encephalopathy (CTE), specialists have a better understanding of the causes and treatments for those who have been impacted. In particular, collision or high-speed sports such as football and hockey have the highest rates of CTE. Soccer players are also near the top of the list for repeated concussions. And while one concussion is traumatic enough, repeated concussions and traumas are even more devastating.

Upon repeated blows to the head, you will typically experience progressively worse symptoms. Though a first concussion can certainly be severe, often it may be milder and cause a headache, fatigue, or dizziness for a few days, leading you to not pay much attention to it and return to play quickly, before the brain has actually had time to heal. What often happens is continued trauma, even if small, that actually causes further damage and more intense symptoms. Headaches may become more severe or constant, accompanied by nausea and vomiting. Even worse, it can progress to short-term memory loss, changes in personality or aggressive behavior, confusion, and difficulty thinking and carrying out tasks that used to be easy. What is often overlooked as a contributor to these worsening symptoms is the inflammation that has occurred to the brain from repeated traumas.

This inflammation, called neuroinflammation, involves activation of cells in the brain called glial cells, followed by a release of inflammatory mediators in the brain and the recruiting of immune cells for repair. This process is meant to help heal the brain, but the cells can also produce chemicals called cytokines that are actually detrimental to brain function. A key therapeutic intervention in this process is the use of natural anti-inflammatory supplements and foods to decrease inflammation and feed the brain.

Food choices can dramatically affect the brain's ability to function properly. Knowing which foods are inflammatory or anti-inflammatory is key for people with CTE. Inflammatory foods to avoid include sugar, processed/refined foods, grains, and dairy. Oils that are high in omega-6 also promote inflammation. These include sunflower, corn, and soybean oils, which are found in a lot of salad dressings and processed foods.

The gluten in grains has been found to promote neuroinflammation in a lot of people, even those without CTE or a brain injury. Avoiding gluten can be a key factor in allowing the brain to heal.

Such foods are typically very prominent in the standard American diet. So, what foods are best for helping the brain?

Foods that help the brain:

- **Protein:** *clean sources of chicken, oily fish such as salmon, mackerel and sardines, and grass-fed beef contain higher amounts of essential fatty acids to help feed the brain. Eating higher amounts of chicken and fish, rather than red meat, is best.*
- **Oils/foods high in omega-3 fatty acids:** *olives, olive oil, avocado/avocado oil, nuts and seeds. Avoid peanuts as they are inflammatory.*
- **Vegetables and fruit:** *contain high amounts of vitamins, especially vitamin C, and minerals; dark green leafy vegetables are particularly high in essential nutrients and antioxidants.*
- **Foods high in magnesium:** *avocado, almonds.*

"Knowing which foods are inflammatory or anti-inflammatory is key for people with CTE. Inflammatory foods to avoid include sugar, processed/refined foods, grains, and dairy. Oils that are high in omega-6 also promote inflammation. These include sunflower, corn, and soybean oils, which are found in a lot of salad dressings and processed foods."

In addition to foods, some supplements help decrease the inflammatory process in CTE. Supplements that combine ingredients can give the brain all of the components it needs to support the immune system, decrease the oxidative stress that is created from injury, and provide the support that brain cells specifically need.

Supplements that help the brain:

- **Curcumin:** *Curcumin is the active component found in turmeric. It has been shown to inhibit not only the acute effects of neuroinflammation but also reduce the long-term consequences of brain inflammation, including memory dysfunction and cognitive defects. It is also a potent antioxidant, helping to decrease oxidative stress.*
- **Resveratrol:** *Proven to provide even more effect when combined with turmeric, resveratrol is also a potent antioxidant, helping to prevent brain cell death that can occur with CTE.*
- **Catechins:** *Found in green tea, catechins reduce oxidative stress in brain tissue and have anti-inflammatory effects. They may help suppress the change in behavior that happens with cognitive defects.*
- **Baicalin:** *an herbal that has been used extensively to decrease inflammation and protect the brain. It has also been shown to have anti-depressant and anti-anxiety properties, in addition to improving cognitive performance.*
- **Apigenin:** *a flavonoid found in fruits, vegetables, and herbs that has anti-inflammatory effects. It is also a potent antioxidant, improves learning and memory, and has protective effects on brain cells.*

Though not an exclusive list, these supplements can be used to decrease the neuroinflammatory process that occurs in CTE. When combined with proper diet and brain-based therapies, people suffering with CTE can experience profound improvements in their symptoms. Since there are neuroprotective effects, it may also be helpful for those who are playing high-risk sports to take supplements preventively as concussion will likely occur at some point.

Although it is often overlooked, the importance of diet and supplements that heal and protect the brain cannot be stressed enough. If you continue to struggle with symptoms from CTE, feeding your body to feed your brain may be the piece you are missing.

Dr. Lori Jokinen *is a Doctor of Chiropractic specializing in functional medicine, nutrition, sports rehabilitation, auto accident injuries, and acupuncture. She incorporates nutrition into all of her patients' care plans.*
www.functionalhealthunlimited.com

Create Connection with **Green Aventurine**

BY KRISTEN BROWN

Green Aventurine is an amazing crystal that creates a powerful bridge between your mental and emotional energy centers and your grounding and motivation energy centers. This connection is important when juggling so many things in today's ever-changing world and when energies fluctuate due to injury, illness, or stress.

Here are three ways Green Aventurine can elevate and connect your energy:

1. **Self-love:** *The first step to connecting to others is connecting to yourself. Green Aventurine is a stone that creates a gentle flow of energy, perfect for easing your focus back to yourself. I love to use a Green Aventurine point (a crystal in the shape of a geometric wand with a point on one end) laid on my desk or bedside pointing at me to bring the energetic focus there.*

2. **Connection to others:** *Just as it can create connection to self, Green Aventurine also creates connection to others. It helps to create empathy and understanding so you can communicate more effectively. Carry a piece of this powerful stone with you when you are meeting new people or are around those you may not always vibe with to create a fresh connection.*

3. **Flow:** *The most powerful thing Green Aventurine does is connect the upper and lower energy centers so you can feel more aligned and focused. Set a large stone in the rooms and spaces you spend the most time to keep your energy moving where it needs to go.*

Green Aventurine is a powerful, yet gentle stone, making it the perfect solution for overall energy flow and connection to yourself and others. It is a worthwhile investment to get multiple Green Aventurine crystals because you can use them in so many ways and places. Give it a try and report back how it makes you feel physically and mentally. And most important . . . enjoy its beauty as part of your daily life.

Want more info on crystals and energy healing? Connect with Kristen at: *namaSync.com*

Kristen Brown *is a best-selling author, keynote speaker, and energy medicine practitioner who charges up her clients by syncing their body/mind/spirit for work and life growth.*

YOGA:

TREE POSE

BY AMY ZELLMER, EDITOR-IN-CHIEF

Yoga is a powerful tool for recovery after brain injury. Contrary to some beliefs, everyone can do yoga — you don't need to be super flexible, have great balance, or even be able to stand up. The beauty of yoga is that every pose can be modified so anyone can be accommodated.

An important aspect of yoga is breathing. Connecting your breath to your body and flow, and getting oxygen flowing to your brain, is what makes yoga so powerful for recovery. Yoga is also a time to quiet the mind, to let anxiety and distracting thoughts drift away.

Tree Pose (Vrksansana) is a standing pose that is powerful in its simplicity, and easily modified for beginners. It is a great pose to improve core strength and balance and is often the first standing balance pose taught to yoga beginners because it is one of the simplest. Don't get frustrated if you wobble or fall over the first time; balance and strength will come with repetition and determination.

Some of its many physical benefits include strengthening your legs and core, while opening your hips and stretching your inner thighs and groin muscles.

Instructions:

1. *Root your feet into the floor with your weight equally distributed on all four corners of each foot.*
2. *Shift your weight onto your right foot, lifting your left foot off the floor. Keep your right leg straight, but don't lock your knee.*
3. *Bend your left knee and bring the sole of your left foot high onto your inner right thigh.*
4. *Press your foot into your thigh, and your thigh back into your foot with equal pressure. This will help keep your hips squared toward the front and prevent your right hip from popping outward.*
5. *Focus your gaze on something stationary to help you keep your balance.*
6. *Take 5-10 breaths, then lower your left foot and repeat on the other side.*

Adjustments and modifications:

- *Keep your foot on the lower part of your right leg (as pictured above).*
- *Use a wall for balance. Lean your butt against the wall, or turn so your left knee comes into contact with the wall when it's lifted.*
- *Arms can stretch overhead, or in prayer hands in front of you.*
- *To make the pose more challenging, you can close your eyes.*

If you are interested in learning more about yoga, check out www.loveyourbrain.com and their yoga programs throughout the U.S. at partner studios, which are completely free to brain injury survivors and caregivers.

Essential Oils: **Christmas Spirit**

BY AMY ZELLMER, EDITOR-IN-CHIEF

HEALTHY LIVING

Essential oils are a complementary tool that can help you achieve a healthy lifestyle. They are easy to use, smell great, and are versatile.

All oils are not created equal. Young Living is the only brand I personally trust because I know they have complete control over their product from seed to seal. Oils sold at health food stores can be misleading. Since they are not regulated by the FDA, the labels may say they are 100% therapeutic grade oils when they are not. You must look closely at the labels. If the ingredients list anything other than the plant stated, or if the label has statements like "For external use only," "For aromatic use only," and/or "Dilute properly," the oil inside that bottle may have been cut with other oils, synthetics, or chemicals.

Christmas Spirit

Christmas Spirit™ taps into the happiness, joy, and comfort associated with the holiday season. It combines orange, cinnamon bark, and spruce to create a warm, spicy, and sweet Christmas essential oil blend that's sure to be loved by everyone in the family.

Thanks to its familiar notes and timeless aroma, Christmas Spirit essential oil blend helps evoke feelings and memories tied to the joy of Christmas and simpler, more peaceful moments. It's a great gift for the holidays, and it can easily become an important part of your family traditions. Diffuse it during the holidays and winter months to help children, family, and friends reminisce about the past and create new memories for the future.

For aromatic use, diffuse or sprinkle on logs in the fireplace, on Christmas trees, on cedar chips for dresser drawers, or on potpourri. Put a few drops in a small spray bottle and fill with water for an enchanting room spray.

For more information on how to use essential oils, please visit: *www.facesoftbi.com/eo*

Making the most of your **GROCERY STORE TRIP**

HEALTHY LIVING

BY SIERRA FAWN GUAY MS, RDN, LDN, CBIS

Grocery stores are stimulating places and can be entirely overwhelming for people living with brain injuries. The sensory stimulation, coupled with the need to complete a task, can feel daunting. Trips to the grocery store have only become more complicated with the COVID-19 pandemic.

Picture this:

You get out of your car and run through your mental checklist: keys, phone, wallet. You walk about twenty paces and a sharp look from another shopper reminds you that you've forgotten your mask. You promptly turn back to your car, only to narrowly avoid being struck by an approaching vehicle. You retrieve your mask and start back toward the store. You stop to allow the store clerk to push ahead with a long line of carts, their wheels grinding against the hot pavement. When you finally enter the store, your body is shocked from the sudden temperature change, and goose bumps form on your arms. You squint your eyes as they adjust to the bright overhead lights. Large, colorful signs remind you to "Wear a mask!" *and to* "Stay 6-feet apart from other shoppers!" *The scent of hand sanitizer penetrates your mask and you crinkle your nose. The store is crowded, so you opt out of taking a shopping cart. Then you realize you've forgotten why you came. You wander about until you find yourself standing in front of the granola bars, which you decide to buy. Suddenly, it seems that there are endless options. You pick up the closest box and examine it. A long list of ingredients stares back at you, more than half you've never heard of. You put it back and decide to try a different aisle. Finally, just as your head starts to ache, you reach the front of the store with a jar of pickles and a mango. After waiting in line for several minutes, you remember that you came to the store for cheese.*

Does this story sound familiar? Do you leave the grocery store feeling exhausted, overwhelmed, and without the very item(s) that you went for? If so, try following some of these tips to set yourself up for success.

Top tips for your grocery store trip

1. *Keep a list of pantry staples.* Before each trip to the grocery store, review your list of pantry staples. If you are out, or almost out, of an item on your list of pantry staples, add it to your shopping list (see Tip #2). Below are some common pantry staples to consider. Each person's list will vary based on his or her preferences, dietary needs, and access to certain foods.
    - Sprouted, whole grain, or bean-based pastas
    - Wild rice
    - Quinoa
    - Canned beans
    - Dried beans
    - Canned sweet potatoes
    - Canned tomatoes
    - Olive oil
    - Lemon juice
    - Maple syrup and/or honey
    - Chia seeds
    - Frozen berries
2. *Write a list of items that you intend to buy from the store.* Having a list will allow your mind to relax a bit and help ensure that you leave the store with everything that you need. Include pantry staples from Tip #1.
3. *Make sure you have supportive devices, as needed.* If it's helpful for you to walk with a cane or wear sunglasses, for example, be sure to remember them.
4. *Frequent and become familiar with one grocery store.* Being familiar with a store will help put your mind at ease. Over time, you will better know where to retrieve your favorite items.
5. *Shop during less busy times, if you are able.* A customer service representative will be able to tell you when the store tends to be less busy. Shopping at these times will help combat mental fatigue.
6. *Consider using curbside pickup, if it's available in your area.* Many stores have started to offer curbside pickup for free with a minimum purchase amount. This can be a convenient way for you to get what you need without having to leave your car.
7. *Bring a friend, if you can.* Bringing a friend to support you and keep you on track can be helpful and can decrease the stress of having to navigate the store alone.
8. *Keep item selection simple by following the "fewest ingredients" rule.* When faced with what seems like endless options, opt for the product with the fewest ingredients. Often, this is the healthier choice.
9. *Avoid the temptation to visit every single aisle.* Stick to your list and visit only the aisles that you need to. This will help combat fatigue.
10. *Set a timer on your phone and head to the checkout when the timer expires.* If you know how long you can withstand grocery shopping before you start to fatigue or get a headache, it can be helpful to commit yourself to short trips only. Setting a timer for your trip can help keep you on track.
11. *Ask for help.* Preserve your energy by asking a store clerk to help you find an item rather than searching for it by yourself.

Sierra Fawn Guay *is a registered dietitian who works with brain injury survivors in Greenville, North Carolina.*

Did you know?

Chia seeds, which are native to Mexico, can absorb up to 27 times their weight in water! Chia seeds were once eaten before battles or long marches as a way to stay hydrated.

Chia Seed Jam

Ingredients:

- 2 cups frozen berries
- 1 tbsp lemon juice
- 2 tbsp honey or maple syrup (optional)
- 2 tbsp chia seeds

Instructions:

In a small saucepan, add frozen berries. Allow berries to defrost over medium heat and bring to a simmer. Cook for 10 minutes or until juices start to thicken. Remove from heat and add remaining ingredients. Refrigerate overnight or until chia seeds have formed a gelatinous covering. Eat with yogurt, on toast, or in any way that you prefer! **Enjoy!**

GIFT-GIVING GUIDE

Whether you have a friend, co-worker, loved one, or simply want to treat yourself — I have created The TBI Gift-Giving Guide just for you!! Each of the items on the list have been hand-picked by me and are items that I use regularly ... if not every day. Of course, I have to start the list with my own book because I really, truly, believe in it and feel that it should be required reading for all healthcare professionals, students, caregivers, and survivors.

BY AMY ZELLMER, EDITOR-IN-CHIEF

1 *Life With a Traumatic Brain Injury: Finding the Road Back to Normal* – by Amy Zellmer

Learn what it means to have a TBI as you read about my struggles and frustrations, and understand what it's like to suffer fatigue and exhaustion after doing a simple task that most take for granted. This book is perfect for TBI survivors, their caregivers, friends, and loved ones. *Available for purchase on Amazon*.

2 TheraSpecs

TheraSpecs are precision tinted, thoughtfully designed eyewear that filter out the harmful light that triggers migraines, headaches, eyestrain, and more. Whether you're looking for migraine glasses, computer glasses, or glasses to protect you from fluorescent lighting, they have you covered. Get $10 off with code: FACESOFTBI *www.theraspecs.com*

3 Rezzimax

Designed to stimulate the vagus nerve and regulate the central nervous system, this product is a must-have for all clinicians and patients. The Tuner is a portable, hand-held device that relieves chronic pain without the need for expensive and addictive medications. With the push of a button, you can ease a headache and be smiling again in minutes. Receive 25% off using the code **tbi**
www.rezzimax.com

4 Young Living Essential Oils

Quality is of utmost importance when using essential oils. I have been using EOs for over 5 years to help me on my journey to brain health and mental clarity. You can sign up for free educational resources at *www.facesoftbi.com/eo*, and if you're ready to get started in the wonderful world of oils go to: *https://yl.pe/5n47*

5 CBD Oil – by Entangled Biome

Helpful with my pain relief and sleep, this hemp-derived CBD oil is made from the cannabis plant with less than .03% THC and is legal in all 50 states. Receive 15% off your first order using code **15tbitribe**
www.entangledbiome.com

6 LoveYourBrain – by Kevin Pearce

TBI survivor Kevin Pearce's experience brought to light the significance of TBI and its impact on his life and those around him. They have a collection of items for sale in their store, with all proceeds benefiting the LoveYourBrain Foundation, which helps send survivors to a weeklong wellness retreat, attend free LoveYourBrain yoga classes, and so much more.
www.loveyourbrain.com

FREEBIE ALERT!

Here is a list of free magazines, videos, and podcasts that everyone is sure to enjoy!!

- TBI Hope & Inspiration Magazine – by David Grant
- Faces of TBI Podcast series – by Amy Zellmer
- The Challenge! Magazine – by the Brain Injury Association of America
- TBI TV – on YouTube
- Concussion Discussions — on YouTube

Brain-Injured Patients Call **Mind-Eye Brain Glasses "Magical"**

BY DEBORAH ZELINSKY O.D.

Brainwear™ Technology Therapeutic and Designed for Comfort

Brain glasses, or Brainwear™ as the Mind-Eye Institute refers to the technology, are not about providing 20/20 eyesight. They offer therapeutic properties that patients with brain injuries, post-concussive symptoms, or neurological disorders often call "magical."

The individualized combination of lenses, filters, and prisms in Brainwear™ are intended to enhance comfort by helping develop or modify visual processing skills and eye-ear synchronization.

Most standard eye examinations are focused on simply improving the clarity of a patient's central eyesight. Testing involves blocking off a patient's important peripheral eyesight and then checking how well the patient can use central eyesight to see high-contrast, stationary letters across a darkened room. Such an assessment is unable to address modern society's demands for highly functioning peripheral eyesight that allows a person to view rolling mobile phone screens, watch movie and video-game special effects, and navigate busy traffic in cars with high-tech computer displays and GPS systems.

Brainwear™ bends light in different ways across the retina, which is made up of brain tissue and is part of the central nervous system. Light is converted into electrical signals. A person's performance will suffer if the signals traveling from the right eye do not match those traveling from the left eye.

In fact, the eye routes information through multiple brain pathways, many of which are not part of eyesight. Light stimulation can rebuild (or, more often, circumvent) damaged or disrupted brain pathways, thereby enhancing a patient's spatial awareness, body posture, perception, and selective attention to sound. In people with learning problems, light can be used to synchronize the signaling.

Continued …

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These electrical signals are partially based on blood flow to the retina. Interestingly, the COVID-19 pandemic has affected retinal blood flow because the wearing of masks changes the amount of oxygen people are used to breathing, causing a higher level of carbon dioxide in the bloodstream. Further research will determine whether or not this uptick in carbon dioxide impacts retinal activity.

The Mind-Eye Institute is recognized worldwide for its assessment of "visual processing," namely brain care rather than eye care. The term "visual processing" refers to the brain's almost-instantaneous ability (partially beneath a conscious level of awareness) to take in external sensory signals (from eyesight, hearing, smell, taste, and touch), meld them with a person's internal sensory signals and then synthesize — process — the information, allowing a person to react and respond to his or her environment.

When intact, visual processing enables people to understand and interact appropriately with the world around them. If brain circuitry is out of sync because it has been disrupted by trauma or disease, or is underdeveloped, people can become confused about their surrounding environment and exhibit inappropriate reactions and responses. If eyes and ears are not in sync, people have to continuously monitor their shifting attention, and that effort becomes exhausting.

The mind-eye connection is unique to each person's processing system and experiences. That is why Brainwear™ is customized to each person's needs and manufactured to be highly precise. The glasses stimulate the retina in ways that bring a person's sensory systems into synchronization, thereby altering his or her environment and positively impacting balance and posture.

We can reduce the stress chemicals produced by the body, modify posture — if the glasses bend the light sideways on the retina, for example, they can influence a person to rotate their head and neck into a straighter position — and often lessen some brain-injury symptoms, including headaches, light and sound sensitivity, balance, sleep problems, and issues with memory, concentration, focus, organization, and decision-making.

Todd Smith of New York state reported that a recent pair of Mind-Eye Brainwear™ reduced the pain in his neck and back and rotated his neck, rib cage, and right shoulder to more normal positions. Ruth Christy of Kenosha, Wisconsin, said her brain injury had made hiking nearly impossible because she was unable to maintain balance while walking the small hills and valleys along her favorite routes. But a pair of brain glasses from the Mind-Eye Institute returned her to her beloved forest paths.

Eyesight has many systems. Two common ones are identification and navigation. Identification comes from the clearness — 20/20 — of a person's central eyesight when looking at a non-moving object. This kind of conscious targeting is what gets evaluated in a typical eye examination. Navigation, however, is based on peripheral eyesight, allowing us to judge background and moving targets in order to assess where objects are located as we move around. It is this navigational system (and its relationship with the identification system) that is most often disrupted by concussion or brain injury. It is frequently also the one that is not always solidly developed in people who have learning problems.

With Brainwear™, the Mind-Eye team modulates the way light strikes the peripheral and non-image-forming pathways of the retina in order to make patients more comfortable in navigating their world.

By so doing, we can reduce the stress chemicals produced by the body and modify posture. If the glasses bend the light sideways on the retina, for example, they can influence a person to rotate their head and neck into a straighter position and often lessening some brain-injury symptoms, including headaches, light and sound sensitivity, balance, sleep problems, and issues with memory, concentration, focus, organization, and decision-making.

This emphasis on comfort — not 20/20 clearness — and the linkage of auditory awareness with visual awareness are what make the Mind-Eye Institute unique. The Institute's advanced mind-eye techniques, coupled with neuro-optometric rehabilitation, enable its optometrists to develop highly tailored Brainwear™ prescriptions that build better brains and, in the words of one patient, "return us to the people we once were."

If you or someone you love, has experienced a brain injury or feels like "something is different," please take our free online "Brain Quiz" or speak with one of our New Patient Advocates and come in for a Mind-Eye exam today by contacting our office at 847-750-4616 or visiting us at *https://mindeye.com/brainhealth*

Deborah Zelinsky *is a Chicago optometrist who founded the Mind-Eye Connection, now known as the Mind-Eye Institute. She is a clinician and brain researcher with a mission of building better brains by changing the concept of eye examinations into brain evaluations. For the past three decades, her research has been dedicated to interactions between the eyes and ears, bringing 21st century research into optometry, thus bridging the gap between neuroscience and eye care.*

"I Finally Feel Normal Again"

BrainWear™ Glasses Are Playing A Critical Role in TBI Recovery

Kevin Pearce Professional Snowboarder Recovers From Brain Injury with Mind Eye Institute

"Ghost In My Brain" Author Clark Elliott Recovers Thanks To "Brain Glasses"

BrainWear Glasses Play Critical Role in TBI Recovery

Brain' Glasses Help Shooting Victim Read, Write Again

Mind-Eye Helps Head-Injured Marine 'Return to Person I Was'

Utah Patient 'Blown Away' by What Eyeglasses Do for His Injured Brain

If you or someone you love has experienced a brain injury or feel like "something is different," please take our free online "Brain Quiz" or speak with one of our New Patient Advocates and come in for a Mind-Eye exam today by contacting our office at 847-750-4616 or visiting us at https://mindeye.com/tbiquiz

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CTE & *Neuroplasticity*

DR. SHANE STEADMAN, DC, DACNB, DCBCN, CNS

Chronic Traumatic Encephalopathy (CTE) is a complex and not-well-understood progressive neurodegenerative process found in people who have sustained repetitive head injuries. This progressive condition is associated with the buildup of an abnormal protein called tau. As tau builds up in the brain and is hyperphosphorylated, it leads to neurofibrillary tangles. These neurofibrillary tangles are found in the frontal and medial temporal lobes and can be widespread throughout the brain and spinal cord. Since an increase in tau can be found in the frontal lobe and medial temporal lobe, the symptoms of CTE begin to make sense. This article is going to explore the possibilities of what can be done through neurorehabilitation and metabolic support, using the concept of neuroplasticity.

Suffering a TBI or concussion does not guarantee a person will have CTE. Factors that may play a role in the progression of this disease include metabolic imbalances, genetics, pathogens, chemicals, and environmental factors. When reading the data and looking at the research done, it was not found in 100% of the subjects examined. If it is not found in every person who has had a TBI, we must ask if there are other factors and strategies that can be done to minimize, slow down, or improve the areas of the brain. Can we do anything nutritionally to support the brain?

An understanding of symptoms can start by looking at the function of the frontal lobe and the medial temporal lobe. The function of the frontal lobe involves executive function, motor function, memory, judgment, impulse control, aspects of depression, social cues, sexual behavior, and interpreting feedback from the environment.

Damage to the frontal lobe can vary from the left and right frontal lobes; for example, speaking fewer words involves the left side whereas speaking excessively involves the right frontal lobe. The medial temporal lobe involves three structures: the olfactory, amygdala, and the hippocampus. A loss of smell can be an indication of the dysfunction of the medial temporal lobe. Declarative memory (facts, figures, and names) is often impaired with medial temporal lobe dysfunction or damage. Finally, with amygdala dysfunction, fear and anxiety tend to be the main symptoms noted. Therefore, signs and symptoms of CTE can include memory loss, impaired judgment, impulsivity, depression, OCD, aggression, anxiety, suicidal thoughts, lack of focus, cognitive impairment, and personality changes.

Neuroplasticity is the brain's ability to form new neural pathways and to strengthen established connections. It can also be identified as the brain's way to adapt, change and modify both structure and function. This can be exciting in terms of rehabilitation. Healthy neurons have the ability to adapt and build stronger connections with surrounding neurons, providing more efficiency within a pathway. When working with patients who have had a stroke, concussions, or other TBIs, this concept is used in developing strategies to improve their function. Once those strategies are proven

effective, and with objective measurements, repetition becomes part of the course of care. Can this be the same with CTE? The answer is that nobody knows at this point and research is still being conducted to understand more about this progressive neurodegenerative condition.

To bring these concepts together, we can start to become creative in neurorehabilitative strategies for those suffering from concussions. Furthermore, could the same strategies be used to help those struggling with the effects of CTE? Since CTE cannot be diagnosed until a person has passed away, working with those who have suffered repetitive head injuries as well as with those who have suffered from any type of brain damage, is imperative. Before implementing strategies for care, make sure that a practitioner is conducting a comprehensive examination of brain function and the neuraxis. This includes a complete history, motor, sensory, vestibular, proprioception and brain stem to list a few. All too often, a patient is given a brief evaluation and, at times, no complete examination of their neuraxis. They are then given a treatment plan without much in the way of objective measurements.

Below are strategies that can be used to support proper frontal lobe and medial temporal lobe function. Please know that a proper evaluation is needed to know the specificity and appropriateness of the therapy being delivered.

Examples of frontal lobe strategies include:

- *Problem solving*
- *Planning and goal setting*
- *Coordinating movement (i.e., juggling, playing catch, interactive metronome)*
- *Social interaction*
- *Visualization*
- *Meditation*
- *Aspect of eye movements (saccades)*

With regards to the medial temporal lobe, the follow example of therapies can be used:

- *Rhythmic music*
- *Tones*
- *Aromatherapy*
- *Memory-based game (online memory games)*
- *Aerobic exercises*

In addition, it is important to look at metabolic influences into brain health. Some of the more common areas to address would be inflammation, blood sugar, iron levels, and hormones. Much of the research looks at the impact of inflammation on the blood-brain barriers and the influence on M1 and M2 cells (anti-inflammatory versus pro-inflammatory mediators). Nutrients and herbals can be utilized to support those with neuroinflammation such as turmeric (curcuminoids), glutathione, DHA (found in fish oil) and neuronal nitric oxide (nNOS). As a fuel source for the brain, maintaining a constant source is needed for daily function. There are different types of fuel sources for the brain such as ketone and glucose. There has been success in both stabilizing glucose throughout the day and ketogenic diets. A practitioner should be able to assist in knowing which type of support is the best.

In conclusion, a comprehensive evaluation gives way to the ability of formulating a course of care. The combination of dietary support, metabolic support, and neurorehabilitation is appropriate when working with those suffering from concussions and, potentially, from CTE. The goal is to provide support and, with tools and research, have the ability to help as many people as possible who are struggling from the effects of a TBI.

Dr. Shane Steadman, DC, DACNB, DCBCN, CNS, *is the owner and clinic director of Integrated Brain Centers. To learn more about how we can help with concussions, stroke, and TBIs, please visit* ***www.integratedbraincenters.com****.*

TBI & *Inflammation*

BY DR. PERRY MAYNARD

According to The Centers for Disease Control (CDC), it is estimated that 1.7 million people suffer a traumatic brain injury (TBI) in the United States each year and 5.3 million are living with TBI-related disability. Traumatic brain injuries are complex injuries that we are just beginning to understand and are now realizing that the immune system plays a large role in brain inflammation after the initial injury, but also in our ability to heal and recover from the injury. When an individual suffers a head injury there is development of damaged tissue. The severity of the injury will usually determine how much tissue is damaged from the initial injury.

The damaged tissue needs to be presented to the immune system so that the "cleanup crew" can come and clear the damaged neurons. Although this is an important initial step, it also can create excessive amounts of inflammation, which is why the more damaged tissue there is, the more risk there is of over-activation of inflammation. Later, we will discuss the important brain cells that help this process go smoothly.

Another process that occurs early on is changes in electrical charge within the cell. Our brains have certain types of natural neurochemicals that calm down the brain, and other neurochemicals that excite and rev up the brain. One of the chemicals that revs up the brain is glutamate. Early on after a head injury, you get a large increase in glutamate outside the cell. The excess glutamate can bind to certain receptors on neurons and create what is called excitotoxicity. This over-stimulation of neurons can create even more damage and more death of neurons in the early stages of a head injury. The critical key is the dance between pro-inflammation and anti-inflammation signaling. Mice studies have shown that too little inflammation can hinder recovery and create greater motor impairment and larger lesions, while too much inflammation can also cause further swelling and blood-brain barrier disruption. This is also most likely why certain people with pre-existing conditions that prime the immune system and create excessive inflammation may have worse outcomes than individuals who are healthy. This is something I see in patients all the time.

Earlier, we talked about how damaged tissue in the brain can create inflammation and that the immune system must attempt to clear that debris and rebuild the damaged circuits. This is where we will discuss the cells that aid in this process, the microglia. I want you to think of microglia cells as the "cleanup crew," the remodeling team in a home renovation. When buying a house to remodel, most likely there will be some damaged parts. Maybe the floor is warped or the wood in the foundation is rotted and you need to make updates so that the house is safer and functions better. Let's say the house experienced a flood from a storm and it ruined some of the infrastructure of the house. It doesn't make sense to remodel the house until you have cleared out the damaged floor and drywall. Once that is done you can begin to rebuild.

This crew in your brain, the microglial cells, have three different modes. In a healthy state, the microglial cells are non-reactive, in a resting state, because the home has no damage. But they are always sensing the environment within the brain to see if their help is needed. When they sense inflammation and damaged tissue, they morph into what are called M1 microglia, the crew that rips apart and helps clear the damaged aspects of the house (brain). This mode of microglia is considered the more inflammatory form, but when well-regulated, it is thought to possibly be neuroprotective. However, when it is prolonged or exaggerated, it can lead to things like second-impact

syndrome. The M2 form of microglia is thought of as more anti-inflammatory and plays a role in healing and tissue remodeling. This is the part of the home crew that builds new floors and walls once the damaged ones have been ripped out.

Research has demonstrated that the severity of the head injury can alter the ratios between M1 and M2 cells and the balance between the two. Just like with most things, it is most likely a fragile balance between the two that allows the ability to work together to resolve inflammation and repair the damaged areas within the brain. Too much of one is most likely not a good thing, it is about balance.

So, as you can see, the immune system plays a large role in recovery from a brain injury within the first few days, but also the first few months.

Research has suggested that we should be focusing on four major things after a head injury:

1. *Limit the acute pro-inflammatory response to the level needed for clearance of debris and danger signals.*
2. *Reduce glutamate excitotoxicity*
3. *Balance microglial cells to promote an anti-inflammatory and pro-regenerative immune system.*
4. *Prevent the development of chronic neuroinflammation and risk for brain autoimmunity*

You may be starting to see how the things in everyday life that drive inflammation may affect one's recovery. While the list that follows may not seem logical in their connections to your brain, they can alter the way the immune system works and create excessive amounts of inflammation.

The following can hinder and prolong one's recovery from a traumatic brain injury:

- *Blood sugar dysregulation*
- *Food reactions*
- *Hormone imbalances*
- *Poor sleep hygiene*
- *Excessive stress/Overtraining*
- *Chronic infections*
- *Environmental toxin exposure*
- *Anemias and things that affect circulation*
- *Autoimmune disorders*
- *Gut Dysbiosis*

All of these, along with a majority of health conditions, have some aspect of chronic inflammation and alterations in the immune system. This is why it is so important that a doctor treating head injuries take these things into consideration. If you are a patient suffering from persistent concussion symptoms it is critical that you are working with a practitioner who understands the interplay between your immune system/inflammation and things like post-concussive syndrome. This is also where the implementation of certain types of diets, specific supplements, hyperbaric oxygen therapy, stem cells, and immune-modulating peptides may have beneficial roles in improving outcomes from traumatic brain injuries.

Dr. Perry Maynard *specializes in the management of complex neurological cases. He enjoys taking principles from cutting-edge neuroscience and applying them to sports rehabilitation and overall human performance.*
www.integratedbraincenters.com

It's Time to Find a *CURE* for *CONCUSSIONS*

BY MICHAEL WYAND, DVM, PHD AND CHRIS NOWINSKI, PHD

Chronic Traumatic Encephalopathy (CTE), a neurodegenerative disease caused by repeated head impacts, has become part of the national conversation as it continues to be diagnosed after death in over 90% of former NFL players studied. NFL stars continued to be sidelined with concussions in the 2019 season, but the conversation rarely goes beyond when they can return to play. The true cost of football and other contact sports on athletes, especially our most vulnerable, children, can sometimes get lost.

The Concussion Legacy Foundation recently gained new insight into the costs of concussions when we started a national helpline to provide family members with one-on-one support. Despite all the attention given to CTE, two-thirds of requests for help are in an area we hear significantly less about — post-concussion syndrome (PCS), or persistent post-concussion symptoms that last months, or even years.

For all the progress we've made on concussion education, policy, and prevention, post-concussion syndrome still afflicts up to 20% of concussion victims each year. With nearly four million concussions from sports and recreation activities alone each year, this is a significant public health problem.

PCS describes a constellation of difficult symptoms that may include chronic headaches, depression, cognitive, memory, vision and balance issues, as well as sleep disorders. A recent study found that only 27% of the PCS patients studied recovered fully, meaning a striking 73% had symptoms that never went away. Even among those who did recover, one-third took longer than a year.

Patients and their families need better answers.

Over the past decade, we've seen amazing results from the world of medical research and development. All sorts of maladies and conditions have been cured or abated in our lifetimes, yet concussion treatment is still primitive compared to therapies for other medical issues. The standard of care for concussions today is effectively the same as it was decades ago — a period of rest, rehabilitation, if needed, and progressive return to life and activity. Scant resources have been dedicated to finding treatments for concussions, despite the human and economic toll. A 2003 CDC report estimated that concussions/mild traumatic brain injuries (mTBI), cost the U.S. nearly $17 billion each year.

We need to accelerate the development of medical treatments for concussions.

Medical treatment for those suffering from concussions is not science fiction, nor is it something for which we need to wait twenty or thirty years. Several cutting-edge companies are making excellent progress in this field. You may never have heard of Oxeia, Astrocyte, or Pinteon Therapeutics, but they and others are dedicated to lessening concussion symptoms and treating the underlying damage of concussions.

While we must continue to fight for our athletes' well-being with the tools we have at our disposal, we must also raise awareness about potential treatments for brain injuries. The medical establishment, the pharmaceutical industry, government leaders, and investors are needed to help us advance drug research and development so that one day we'll have an effective treatment for concussions. Rest is not enough. The time to devote more resources to support this cutting-edge scientific research is now. We have the ability to deal with this problem; we need the commitment to act.

Michael Wyand, DVM, PhD, *is CEO of Oxeia Biopharmaceuticals. Oxeia is conducting Phase 2 human clinical studies for its therapeutic drug, OXE-103, to treat concussions.*

Chris Nowinski, PhD, *is cofounder and CEO of the Concussion Legacy Foundation, cofounder of the Veterans Affairs-Boston University-CLF Brain Bank and an advisor to Oxeia Biopharmaceuticals. A former All-Ivy defensive tackle for Harvard University and WWE professional wrestler, he suffers from PCS symptoms 16 years later.*

CELLULAR HEALTH:
What it Can Mean to You

BY KELLY HARRIGAN

The World Health Organization has predicted that traumatic brain injury (TBI) will be the third leading cause of global mortality and disability this year, and TBI is currently one of the leading causes of disability among working-age adults. As we are aware, TBI is characterized by primary damage due to mechanical forces applied to the head as a result of trauma, and subsequent secondary damage resulting from a complex cascade of biochemical events that may lead to autophagy, or cell death. Further, oxidative stress plays a key role in the subsequent secondary injuries, with harmful effects contributing to permanent damage and the development of neurodegenerative disease. The scientific field is generating interest with its look at redox signaling molecules as a key to improving cellular health, which may have important long-term implications for anti-aging, disease, and neurodegenerative disorders.

I recently virtually sat down with Dr. Jennifer Kungle, with our dogs and kids in the background like so many other parents in our pandemic times, to chat about cellular health. Dr. Kungle is a visionary specialist who heads up The Center for Vision Development. She regularly attends seminars and conferences to investigate and promote best practices for her patients. The following are excerpts from our chat:

KH: How did you become interested in cellular health and why is it such a big deal in the medical industry these days?

Dr. Kungle: I have long been interested in health and wellness to support the overall health of my patients, as you know from this magazine's issue on Syntonics. At one conference they were discussing cellular health and its importance. Redox signaling is definitely an interesting and evolving area of medical research for its anti-aging and immune system benefits, in addition to disease recovery and prevention. I feel that, particularly with my concussion and TBI patients, improved cellular health could lead to benefits not only with their vision but also with their brain fog and cognitive deficits.

KH: Describe what redox signaling is and why it is important.

Dr. Kungle: Redox signaling molecules are the foundations for life and cellular health. In our bodies, each cell contains up to 5,000 mitochondria. They are the "power plants" that convert fuel (the food that we eat) into ATP (adenosine triphosphate), which is the body's energy currency. Millions of times per second they produce a set of reductant molecules and oxidative molecules, hence the name "redox" molecules. In the 1990s, it was discovered that these molecules send out bursts of electrochemical signals to the brain and nearby cells. Then they quickly revert into the salt water from where they started. Redox molecules essentially allow cells to communicate life-sustaining instructions with each other, for example, telling the immune system whether to heal a cell or destroy itself.

KH: In other words, it helps your body rid itself of harmful junk and maintain optimal good stuff.

Dr. Kungle: Yes, this is important for so many health benefits, including gene regulation, tissue repair, disease prevention, and treatment, as well as boosting your immune system. Little nagging pains, sleep issues, and feeling generally "off" can all be signs of cellular disruption and, of course, as we age, we produce fewer redox molecules. Diet, stress, and environment also play a role in slowing down or impairing our cellular function as they inundate our lives and weaken our body's defenses. Over time, damaged cells and tissues are not repaired or replaced efficiently. These inefficient and damaged cells divide and conquer, as they say, overcoming healthy tissue, spurring the aging process. Proper redox signaling protects the body from oxidative stress and free radical damage.

KH (with a laugh): It gives a whole new meaning to the phrase "not as good as I used to be." Not a whole lot to recommend for the aging process. . .

Dr. Kungle (chuckles in agreement): It has been scientifically tested and shown that proper signal activation of genetic pathways boost anti-aging processes, activate anti-oxidant shields, act as an overall tune-up for cell communications, modulate hormone balance, improve gut health, and maintain a healthy inflammatory response.

KH: We can go back to the basics then with anti-inflammatory diets, exercise, avoidance of toxins, stress reduction, and good sleep hygiene, all of which are important to laying the foundation for good cellular health, which plays an important role in neurodegenerative disease for our readers. Thank you for your insights, Dr. Kungle. Always a pleasure to hear your thoughts on promoting good health.

Kelly Harrigan *is a single mum, veteran, and TBI survivor with a girl child and a frenchie. With oolong tea in hand and humor on hand, she lives in Annapolis, Maryland.*

BY KELLIE POKRIFKA

The Complex Web of **Brain Injury**, **Chronic Pain**, & **Mental Health**

Those of us who have sustained a brain injury frequently feel alone. We feel like nobody else has ever experienced this. In the same way, those of us who have experienced mental health issues after sustaining a brain injury, frequently feel alone. We feel like nobody else has ever experienced this.

These thoughts could not be more incorrect. In fact, mental health issues are some of the most common symptoms following brain injury. While anxiety, depression, and post-traumatic stress disorder tend to be the most prevalent, any mental health condition can arise or be exacerbated following brain injury.

While, like most aspects of brain injury, we do not have adequate studies covering this area, there have been numerous reports compiling data regarding mental health and brain injury. The numbers change significantly depending upon the study, but one set of data concludes that, after brain injury, about 70% of patients will develop an anxiety disorder, 50% will develop depression, and 17% will develop suicidal ideation or attempts. These staggering statistics need to be addressed. Even the smallest number states that almost one in every five surviviors of brain injury will consider, attempt, or complete suicide.

These disorders can arise both from the organic damage to the brain and from the situational changes that occur after brain injury, such as a decrease in perceived quality of life and post-injury social isolation. The area of the brain most frequently damaged in brain injury is the frontal lobe, which is also the area implicated in most mental disorders. The frontal lobe largely controls our moods and emotions. In addition, this area can control the way we react to our emotions, making us more impulsive and less rational, and our lack of impulse control can leave us more inclined to self-harm.

Another incredibly complex factor between brain injury and mental health disorders is chronic pain. Brain injury frequently results in chronic pain, which can then further exacerbate mental health issues. In civilian populations, 75.3% of those suffering from a concussion or other forms of traumatic brain injury (TBI) will experience chronic pain. Active duty military rates are also staggering — 57% of those suffering from TBI will experience chronic pain. People living with chronic pain are twice as likely to attempt or complete suicide. One out of 10 suicides involve chronic pain.

What leads people living with chronic pain to consider ending their own lives? The number one factor is perceived burdensomeness. The perverse thought that crawls into our heads is that the extra care we need from our loved ones can overwhelm them to the point that it would be easier on them if we simply were no longer here. Along with perceived burdensomeness, other psychosocial factors that lead chronic pain patients to suicide include thwarted belongingness, hopelessness, catastrophizing pain, and mental defeat. Surprisingly, certain studies show that the level of disability and pain severity are not correlated with suicidal risk.

The pervasive stigma of mental health disorders hampers many of us from seeking proper care. These symptoms are real and they are treatable. Talk openly and honestly about these issues with both your practitioners and your loved ones. Know that there are more treatment options available today than at any other point in history.

Believe in your own recovery.

Kellie Pokrifka *is a TBI survivor and works as an intermediary between the experts and the patients with brain injuries.*

Life Lessons Learned *from a TBI*

BY AMY ZELLMER,
EDITOR-IN-CHIEF

In conjunction with National Concussion Awareness Day on September 18th, I released the Concussion Discussions video series.

This series was created specifically with the survivor and caregiver in mind, answering questions that YOU, the viewer, submitted. It is yet another free resource I have created to help educate fellow survivors, and hopefully help you find the resources you need sooner rather than later in your recovery.

While on my own journey, it took me 2.5 years to find Functional Neurology, which literally gave me my life back. After seeing over a dozen doctors, most with "neuro" in their title, I felt defeated, deflated, and ready to just give up. I was trying to come to terms with the idea that I might be the best I would get and that I just needed to accept the fact and move forward with my life. I was starting to accept what doctors had been telling me — that there wasn't anything more they or I could do — until I realized it was total and utter BS.

There ARE doctors out there who know how to help us. There ARE providers doing amazing things to advance concussion recovery. There ARE modalities that are helping survivors get their lives back and return to a sense of normalcy.

Just as every single brain injury is different, so is every recovery. What works for one person might not be the right fit for the next. However, there are doctors and providers who understand this, and know how to tune-in to your specific problems and deficits and know the right exercises that will help you feel better.

The moral of the story: No matter how far out you are in your recovery, there is help for you. You have to look outside of the traditional medical system, but it truly does exist. If you are tired of being told by doctors that it's just in your head, or that there's nothing they can do for you, or that you just have to give it more time . . . then watch my free video series and learn about the world of functional neurology and how it can help you!

www.concussiondiscussions.com

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