



Vanderbilt Sports Concussion Center
Vanderbilt Sports Concussion Research

Co-Directors' Message

We appreciate your interest in the Vanderbilt Sports Concussion Center (VSCC)! From all four Co-Directors – Scott Zuckerman (neurosurgeon), Doug Terry (neuropsychologist), Andrew Gregory (pediatric sports medicine), and Katie Gifford (neuropsychology) – we are delighted to share some important updates regarding the VSCC. Now in existence for over a decade (since 2010), VSCC continues to treat athletes of all ages who have suffered a sport-related concussion. We are a multi-disciplinary clinic encompassing providers from 9 medical specialties (sports medicine, pediatrics, neurosurgery, neuropsychology, neurology, physical therapy, ophthalmology, psychiatry, radiology), and include a team of medical doctors, physician’s assistants, nurse practitioners, physical therapists, and most importantly, our certified athletic trainers who are on the sidelines nights and weekends to keep our athletes safe. We treat patients from over 23 high schools and see patients in clinic at 8 different locations, including: Nashville, Franklin, Murfreesboro, Mt. Juliet, and Hendersonville. In addition to treating acute sport-related concussions, we see athletes with prolonged concussion symptoms who have experienced symptoms for months and sometimes years.

Being centered at one of the leading tertiary medical centers in the country, we have six codified pathways to treat patients still struggling with specific symptoms: 1) headache, 2) vestibular/balance, 3) visual/ocular, 4) cognitive/memory, 5) sleep, and 6) psychological health. The brain is a complex organ and recovering from a concussion can be a frustrating

Connect With Us

Follow us on
Twitter [@VUMC_Concussion](https://twitter.com/VUMC_Concussion)

Check out our
website www.vumc.org/vscc-research

Sign up for our email list!



process. Knowing that no concussion is the same, nor are any two patients the same, we pride ourselves in designing individualized treatment plans to get each athlete back to school, sport, and life as swiftly and safely as possible.

Integral to the VSCC's mission is advancing the field of acute and long-term concussion care. Our research arm – V-SCoRe (Vanderbilt Sports Concussion Research) – has published approximately 140 manuscripts over the last 10 years, collaborating with other institutions in the United States and world. Our research aims to improve the accessibility, efficiency and effectiveness of concussion care. We plan to continue relentlessly pursuing our mission to provide the highest level of concussion care to all athletes in the southeastern region and beyond, and to conduct paradigm-changing research that impacts athletes of all ages. Thanks for tuning in!

Best,

VSCC Co-Directors
Scott Zuckerman, M.D., M.P.H
Douglas Terry, Ph.D.
Andrew Gregory, M.D
Katie Gifford, Psy.D.

VSCC Coordinator
Tim Lee

Newsletter Highlights

- Co-Directors' Message
- Patient Spotlight
- Ten Years of VSCC
- ATC Spotlight
- Research Corner
- Student Spotlight
- Benefits of Team Sports



VSCC Quarterly Lecture Series

Vanderbilt Talks About Sports Concussion (V-TASC) Quarterly Lecture Series

**The Latest Evidence on Return to Play
after Sport Concussion:
Routine Recovery, Prolonged Symptoms, and
Brain Hemorrhage**

Tuesday January 18th, 2022
5:30-6:30pm EST

"Online link to the live lecture will be circulated the day before the event"



Moderated by VSCC Founders:



Allen Sills, M.D.



Gary Solomon, Ph.D.



Vanderbilt Sports Concussion Center
Vanderbilt Sports Concussion Research

[Sign up here!](#)

Speakers:



Routine Recovery
Mohammad Nadir Haider, M.D., PhD
University at Buffalo



Prolonged Symptoms
Donna K. Broshek, Ph.D., ABPP-CN
University of Virginia



Brain Hemorrhage
Scott Zuckerman, M.D., MPH
Vanderbilt University Medical Center

VANDERBILT  UNIVERSITY
MEDICAL CENTER

Patient Spotlight

Common Concussion Symptoms:

- Headache
- Vestibular/Balance
- Visual/Ocular
- Cognitive
- Sleep
- Psychological Health



"He's feeling good and so happy to be back on the ice. His team named him Captain this year... a happy ending to a tough year."

-Patient's Mother

Though most sport-related concussions resolve in 1-2 weeks, some do not, and VSCC specializes in these difficult and complex concussion cases. We wanted to highlight one particular success story that shows how the VSCC helped a 16-year-old competitive ice hockey player navigate his concussion and prolonged recovery.

In December 2020, Steve (patient name altered) tripped and slid headfirst into the boards during a game, and experienced blurry vision. He was subsequently removed from play. The blurry vision returned during practice the next day, which prompted further evaluation. He was soon seen by Dr. Rummo in sports medicine clinic for headaches and double vision, and Steve was diagnosed with a concussion. After being symptomatic for 4 weeks, Dr. Rummo referred Steve to a neuropsychologist, Dr. Katie Gifford, who coordinated the patient's care from that point forward. Dr. Gifford identified oculomotor and vestibular deficits (which were treated with a special type of physical therapy), some symptoms of anxiety (which were later assessed by psychiatry), and blurry vision (which were assessed by our neuro-ophthalmologist). With Dr. Gifford formulating a three-pronged approach for Steve (vestibular therapy, psychiatry, and visual therapy), Steve embarked on his journey back to the ice.

Over the next two months, Steve put in the work. Physical therapy addressed oculomotor and vestibular deficits, while neuro-ophthalmology recommended reading glasses to address blurry vision. Steve was diagnosed with anxiety during his psychiatry visit and prescribed appropriate medication. Steve also engaged in the "active rehabilitation" provided by the VSCC, which included: aerobic training, sport-specific coordination exercises, visualization techniques, and a home exercise program.

Though Steve's symptoms were improving and he could exercise regularly, he continued to have persistent headaches and anxiety, and he felt his recovery had plateaued. Four months after his initial visit with Dr. Gifford, Steve came back to the clinic for a re-assessment of his symptoms. Steve was doing better on a variety of objective tests related to concussion, and Dr. Gifford thought it would be most beneficial for him to slowly return to activity and get back on the ice in a safe and monitored way. Over the next month, Steve gradually returned to light sport-specific work and began practicing his hockey skills. He slowly increased skating time and progressed through the appropriate stages of the return to play protocol. He was cleared to return to play 6 months after his concussion. He played in his first game in the fall season and reported feeling 100% back to normal. Steve's mom said to his care



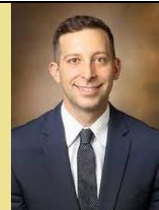
Katie Gifford, Psy.D.

team, *“He’s a little out of shape and a bit rusty, but no concussion-related issues really. He told everyone that it felt so good to play again & feel good while doing. So, Success!”*

Concussion recovery varies greatly, and each patient warrants an individualized approach. As a team, the VSCC values the ability to provide individualized and comprehensive care to our patients, so they can return to the activities and sports that they love. We are overjoyed that Steve put in the time and effort needed to fully recover, and we look forward to hearing about his future hockey successes.

Ten Years of VSCC: A Lesson in History and New Beginnings

Scott L. Zuckerman, MD, MPH



Early Years

The VSCC was founded in 2010 by three Vanderbilt physicians who had built their career treating athletes of all ages and levels – Dr. Allen K. Sills (neurosurgeon), Dr. Gary Solomon (neuropsychologist), and Dr. Andrew Gregory (pediatric sports medicine). Each of these founders had strong connections with sports and athletes prior to their coming together at the VSCC. At the University of Tennessee Medical Center in Memphis, Dr. Sills worked closely with the Memphis Grizzlies as well as with athletes at local colleges and high schools (including his alma mater Mississippi State). He treated sport-related concussions, sport-related spine injuries, and other neurologic conditions affecting athletes. Dr. Gary Solomon worked in private practice as a neuropsychologist in Nashville for 26 years before being recruited to Vanderbilt by Dr. Sills in 2010. He had worked closely with the Tennessee Titans and Nashville Predators since 1998 as a team psychologist, concussion specialist, and draft advisor. Dr. Andrew Gregory, a collegiate volleyball

player himself, had treated pediatric patients with sports concussion and sports injuries for many years and was also affiliated with the U.S. National Volleyball Program. Together in 2010, with backing of both the Neurosurgery and Orthopedic Surgery departments under the leadership of Drs. Reid Thompson and Herbert Schwartz, the VSCC was created.

As all new ventures start with humble beginnings, monthly meetings of the VSCC started in the main hospital cafeteria. There, Dr. Sills, Dr. Solomon, and Dr. Gregory would brainstorm ways to develop and expand the clinic, begin new marketing strategies, and reach concussed athletes throughout the middle Tennessee, southern Kentucky, and northern Alabama/Georgia areas. Clinics started in Nashville first, followed by Franklin and Mt. Juliet. Tim Lee, ATC, became the VSCC Coordinator in 2012. Tim’s responsibilities included serving as a physician extender to Dr. Gary Solomon, while coordinating concussion treatment among the complex care team members in both the pediatric and adult service lines.

Education

Educating other clinicians and academics became a major goal of the VSCC early in its existence. In 2012, the first annual VSCC Provider's annual meeting began, where all concussion providers in the Vanderbilt system would meet to review and update concussion-related protocols and processes. Dr. Sills, Dr. Solomon, Dr. Gregory, and Tim Lee routinely presented clinical research at local and national medical seminars as well. In 2013, the VSCC successfully obtained a grant from Rawlings Sporting Goods to perform sport-related concussion educational seminars for coaches and school system administration across the state of Tennessee. The VSCC presented four educational programs, two in Middle Tennessee, one in Jackson, TN, and one in Chattanooga, TN, all about sport-related concussion, ranging from diagnosis to treatment and long-term recovery. VSCC providers have routinely given over 20 educational presentations to medical and lay person audiences annually.

Research

In the fall of 2011, the scholarly mission formally began, as Dr. Solomon began what is now known as V-SCoRe (Vanderbilt Sports Concussion Research). The first paper authored out of V-SCoRe was led by Scott Zuckerman and Gary Solomon, in collaboration with the University of Pittsburgh, and evaluated the importance of gender in concussion outcomes in 40 male versus 40 female soccer players. Zuckerman and Solomon found no statistically significant differences in post-concussion testing areas of visual-motor speed, reaction time, impulse control, and total symptom score. This research effort expanded over the next 10 years to include over 50 residents and students across several medical specialties. Since 2012, V-SCoRe has published 142 papers and given 218 presentations. V-SCoRe has been represented nationally and internationally, at neurosurgery conferences, neuropsychology

conferences, Centers for Disease Control (CDC) grant review processes, and the esteemed Concussion in Sport Group conference in Berlin, Germany. V-SCoRe continues to collaborate with other leading institutions such as the University of Pittsburgh, Medical College of Wisconsin, Harvard Medical School, and University of North Carolina. While still studying the importance of acute recovery from sport-related concussion, V-SCoRe maintains a strong focus on evaluating the long-term outcomes of both concussions and a career in sports in an attempt to critically evaluate the presumptive diagnosis of chronic traumatic encephalopathy (CTE). In 2018, Dr. Aaron Yengo-Kahn was named Co-Director of Research. Under Dr. Yengo-Kahn's leadership, V-SCoRe has expanded its work to include studies of genetics, biomechanical helmet safety, cost-effectiveness, and neuropathological testing.

Future

Fast forward to 2021, after Dr. Solomon's retirement in 2019 and Dr. Sills' new post as the Chief Medical Officer of the National Football League (NFL), the VSCC has set the stage for a bright future. With the experience of Tim Lee and Dr. Gregory, neuropsychologist Dr. Katie Gifford began as Co-Director and took the lead in seeing complex concussion patients from middle school age to pro-athlete level. In 2021, Dr. Douglas Terry was recruited from Harvard, having benefited from the mentorship of Dr. Grant Iverson, a prolific concussion researcher and international leader in the field. That same year, Dr. Scott Zuckerman also returned to Vanderbilt to help lead the VSCC. Kristen Neitz also joined the VSCC team as its first ever research coordinator, with a strong background in both athletic training and clinical research. With a robust foundation and revitalized leadership, the VSCC is poised to make an even larger clinical and scholarly impact as we enter 2022 and beyond and carry forth the mission embarked by its founders 10-years ago.

Athletic Trainer Spotlight: Kerry Wilbur, MEd, LAT, ATC

Kerry Wilbur is the Associate Athletic Trainer and Concussion Management Coordinator at Vanderbilt University and has been providing care to Vanderbilt athletes for over 16 years. Given Kerry's experience and vital role as the link between VU Athletics and the VSCC, she was an obvious first choice for our athletic trainer spotlight. Certified Athletic Trainers (ATCs) are the "front line" providers in the world of sports concussion care, and any experienced sports medicine provider knows that care provided by the ATC is invaluable to any athletic injury



Wilbur completed her undergraduate degree in Athletic Training at the University of Miami and her master's degree in Kinesiology with a focus in Athletic Training & Sports Medicine at Temple University. The idea of joining Vanderbilt was intriguing to Wilbur because of the unique medical model that exists here: "Vanderbilt University Medical Center is a huge resource for us as ATs and it's amazing to work with all the best professionals in their fields. Our team physicians here are incredible!" Wilbur is grateful for being able to work with many great AT's, physicians, and other healthcare professionals over the years and has had "the pleasure of working with absolutely awesome athletes (and coaching staffs) here at Vanderbilt!" Wilbur along with the rest of the Vanderbilt athletic training staff are key players in furthering V-SCoRe efforts and we are immensely grateful for their contributions thus far. Kerry sat down with our VSCC research coordinator Kristen Neitz for an interview.

Fun facts:

- Originally from South Florida
- Loves any activity outdoors and involving water
- Enjoys surfing, hiking, and traveling

<p>Q: What is one thing about caring for sport related concussion in athletes you would like the public to know?</p> <p><i>WILBAR: "It's difficult and can be frustrating - and that's ok. Concussions are complex, individual injuries. No two are the same. I tell our student athletes that the brain is a big deal and therefore all concussions or suspected concussions need to be taken seriously. The science and medicine with understanding and treating concussion is always evolving. We feel very lucky here at VUMC to have the VSCC team as a resource."</i></p>	<p>Q: What is your job like working as a collegiate athletic trainer?</p> <p><i>WILBAR: "We have a very nontraditional job and that's what makes it fun but also very chaotic. A lot of people ask 'what does it take to be a college athletic trainer?'-- adaptability and patience. It's hard to stick to plans sometimes, and plans change but that's okay. You just do what you gotta do"</i></p>	<p>Q: If you could chose 3 words to describe your approach to athletic training and care for athletes with concussion what would they be?</p> <p><i>WILBAR: "Effective, efficient, and passionate. The world of college athletic training is fast paced, ever-changing, and can be somewhat chaotic. Definitely not a normal job setting. We are committed to providing the best level of care in the best way for our patients. How we can do this often changes day to day depending on the demands. Being passionate about what you do and taking great care in how you do it means you can get it done!"</i></p>
---	---	--

Research Corner

Research Corner is a place for us to share our recent and upcoming research projects.

To access our latest works, visit our website

www.vumc.org/vscc-research

CTE Response

Drs Zuckerman, Yengo-Kahn, and Terry authored a letter in Neurosurgery stressing the importance of the scientific process when doing research on Chronic Traumatic Encephalopathy (CTE) given the public interest in this diagnosis. This piece was written in response to neuropathologist Bennett Omalu, MBBS, suggesting that the definition of CTE be expanded.

Race and Ethnicity in Concussion

Given the importance of sociocultural context in medicine, we found that Black athletes seen at our center report earlier symptom resolution from concussion than White athletes. The reasons for this are not immediately clear and we are continuing to conduct studies that consider how access to care and patterns of symptom reporting might contribute to these findings.

Refinement of saliva microRNA biomarkers for sport-related concussion (Hicks et al.)

Vanderbilt participated in a multi-center study showing that analyzing micro-RNA in saliva may be useful in helping to diagnose a concussion and monitor recovery. Saliva samples may have major advantages to blood samples when diagnosing concussion in real time on the sideline.

The Behavioral, Psychological, and Social Impacts of Team Sports: A Systematic Review and Meta-analysis

A meta-analysis of 34 studies from 10 countries showed that young athletes who played team sports had decreased smoking/tobacco rates, alcohol/drug use, and depression/anxiety compared to students that did not play team sports.

Sport Related Structural Brain Injury and Return to Play: Systematic Review and Expert Insight

Given how rare a sport-related structural brain injury is (i.e., a brain hemorrhage from a sport-related head injury), Vanderbilt led an international study that surveyed 31 sports neurosurgeons to reach consensus regarding when it is safe for athletes to return to play after suffering a brain hemorrhage.

Cost of a Concussion

A study of 144 concussed male high school football athletes seen at VSCC showed that total concussion costs were \$115,000, with an average of \$800/concussion. Visiting the emergency department, higher symptom score, and persistent symptoms were each independently associated with increased concussion costs.

Student Spotlight: Alan R. Tang



Alan Tang, a third-year medical student at Vanderbilt University, is a vital member of the V-SCoRe research team and has been working with our research group since his first year of medical school. Because of his hard work and team-oriented approach, we wanted to highlight Alan's excellent contribution. At a young age, Alan was involved in several sports and has always valued the benefits associated with adolescent sports participation. When Alan entered medical school, concussions were constantly in the news. The topical nature of sport-related concussion, along with his love for sports, drove him to seek out sport-related concussion research. Since his first year of medical school, Alan has been involved in several concussion projects at Vanderbilt, ultimately helping to push our research goals forward. Tang sat down with our research coordinator Kristen Neitz for a brief interview.

Q: What is the most valuable thing that you've learned so far working with V-SCoRe?

TANG: "I think this is a really unique situation where you work with not only people at different levels of training, like attendings, PhDs, all the way down to undergrads, but you also engage people across a multidisciplinary group, including psychiatrists, neurosurgeons, sports medicine physicians, and I think you learn a lot from listening to different people from different backgrounds."

Q: How do you think the Vanderbilt Sport Concussion Research (V-SCoRe) program has impacted your medical education?

TANG: "I think it's certainly helped me in terms of working with different people of different backgrounds. Working with V-SCoRe given me an avenue to explore something that's outside of the curriculum that I have always been interested in."

Fun Facts:

Swam and played water polo growing up

Fan of all Boston sports teams

Loves wine and travels to Napa every year

The Benefit of Team Sports

Douglas Terry, Ph.D



Team sports are a hallmark activity for American youth. The most recent data available from the National Federation of State High School Associations shows that 4 of the top 5 high school sports are team sports comprised of multiple individuals working together for a common goal (i.e., basketball, soccer, baseball/softball, football for boys, and volleyball

for girls – the only one that isn't a team sport is track and field). While most of the research and clinical care at the Vanderbilt Sports Concussion Center is devoted to care of the acutely concussed athlete, we think it's equally important to address the variety of health benefits afforded by team sport participation – both during youth as well as many years later –

especially as the public concern over long-term brain health with contact sport participation grows.

It's no surprise that playing sports is associated with better physical health, but the benefit of sports extends to the social and psychological areas. More specifically, youth athletes have increased muscle mass, better cardiovascular fitness, lower rates of obesity, healthier diets, lower rates of physical health problems, and other benefits compared to non-athletes. Beyond these physical benefits, there are a variety of positive social and psychological health outcomes to youth sports. A systematic review that examined 30 studies on this topic discussed that the most common positive outcomes that youth athletes had, compared to non-sport participants, were higher self-esteem, better social skills, fewer depressive symptoms, higher confidence, and higher competence. Team sports, specifically, are associated with lower rates of social isolation, higher social acceptance, better emotional self-efficacy, and lower symptoms of depression, hopelessness, and suicidality. Our own V-SCoRe group published a meta-analysis of 34 studies from 10 countries and found that team sport participation led to decreased rates of smoking/tobacco use, alcohol/drug use, and depression/anxiety.

Studies have also showed that youth sports, especially team sports, have lasting benefits. In a study that examined adolescent health one year apart, those who were playing team sports at the first time point had lower rates of depressed mood and better school performance one year later. Another study showed that, among girls, team sport participation in early adolescence was associated with better self-esteem in middle adolescence. Another study found that team sport participation in 10th grade was associated with less frequent feelings of social isolation in their mid-20s when compared to other non-sport high school activities.

Lastly, it appears that patterns of physical activity set during youth carries forward into adulthood – those who participate in sports are more likely to exercise as adults.

It is hard to mention team sports – especially contact team sports – without the growing concern over long-term brain health and chronic traumatic encephalopathy (CTE). For example, in a study by our group that surveyed 884 parents, 38% wouldn't let their child play football due to safety concerns. The CTE studies that many of us hear about in the media often examine the health of former professional football players, a highly specialized population that represents <1% of all athletes. It is unclear if the conclusions of these studies are applicable to athletes who do not play professionally and have less exposure to head injuries over the course of their athletic career. There have been far fewer studies that have examined the long-term health of non-professional athletes. Moreover, many of the studies to date have not found a relationship between high school collision sport participation and later-life mental health difficulties/neurodegenerative disorders. For more information about CTE, we recommend the [Fact Sheet](#) sponsored by the Sport Neuropsychological Society.

The decision to play team sports, and team contact sports, is one that should be made by each athlete and their family. The myriad of benefits from team sports has been quantified in various studies, in different countries, over many decades. Team sports impart lasting positive benefits on our youth. On the flipside, though concerns over long-term brain health loom, we must keep in mind that the study of CTE is in its infancy and many of the studies to date examine former professional athletes who bear little resemblance to the average youth or high school athlete. At the Vanderbilt Sport Concussion Center, we hope not only to provide you with superb clinical care, but also provide current, balanced information related to the state of the science around concussion and health.

<p>Look for our next Newsletter Spring 2022!</p>	 <p>VSCC • V-SCoRe Vanderbilt Sports Concussion Center • Research</p>	<p>If you have any questions about the VSCC Quarterly Newsletter, please reach out at vscc@vumc.org</p>
--	--	--