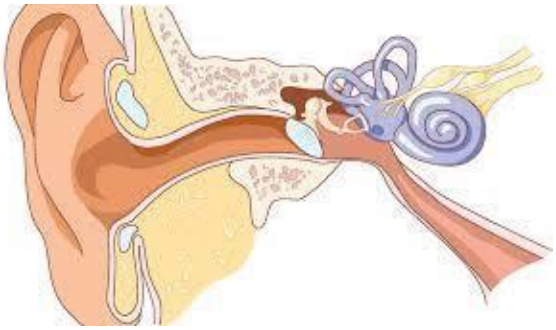
VANDERBILT UNIVERSITY
MEDICAL CENTER

VSCC Quarterly Newsletter

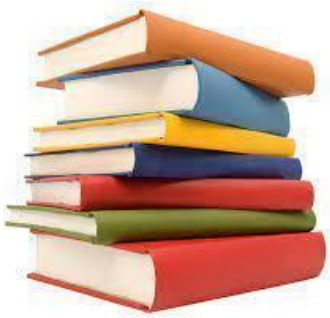
Summer 2022

Vanderbilt Sports Concussion Center
Vanderbilt Sports Concussion Research



What Does Vestibular Rehabilitation Following Concussion Look Like?

We interview physical therapists, Holly Cauthen, PT, DPT and Adam Meidinger, DPT, BS, to understand their roles in rehabilitation following concussion.



Return to Learn Following Concussion

created by VSCC

We are launching a new Return to Learn (RTL) protocol to assist student athletes with successfully returning to the classroom following a concussion.

Providers Spotlight

This issues spotlight features Tim Lee, MHS, MS, ATC, a vital founding member of the VSCC team.

Student Spotlight

Our student spotlight highlights third year medical student, Kate Hajdu, BS.

Using the Guardian Cap and Mouth Guards as Accelerometers

By: Douglas Terry, PhD, and Scott Zuckerman, MD, MPH

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

Best Practices for Visual and Vestibular Deficits Following Concussion

Tuesday, July 19th, 2022
5:30-6:30pm EST

link to the live lecture will be provided when you register for the event

SPEAKER:

Anne Mucha, PT, DPT, MS, NCS
Vestibular Rehabilitation Coordinator
UPMC Centers for Rehab Services and Sports Concussion Program

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Vanderbilt Sports Concussion Center • Research

Sign up here!

VANDERBILT UNIVERSITY MEDICAL CENTER

Quarterly Lecture Series

Our next lecture series will occur on July 19th, at 5:30pm EST. Click the sign-up button above to register!

Follow us on Twitter	Check out our website	Sign-up for our email list to receive updated information	Contact us at
@VUMC_Concussion	vumc.org/vscc-research	Sign-Up Here	vscc@vumc.org

Co-Director's Message

We hope everyone is enjoying the summer and not getting too hot in the middle Tennessee weather! Our clinical and research efforts have continued at the Vanderbilt Sports Concussion Center. We just finished hosting a summer student, Carter Burns, who did a phenomenal job with a research project on mental health after sports concussion. We also started our med scholars student, Jacob Jo, who will be completing many different studies regarding concussion care. Despite the break in high school sports, we have continued to establish the presence throughout middle Tennessee. With the football season starting soon, we look forward to obtaining neurocognitive baseline tests on many athletes throughout the area. We would also like to congratulate our new concussion coordinator Garrett Perry who takes over for Tim, who has over a decade of service as the Vanderbilt Sports Concussion Center coordinator. We are pleased to promote our third lecture Vanderbilt Talks About Sports Concussion (V-TASC) next week on 7/19/2022, featuring Anne Mucha who will discuss vestibular deficits following concussion (click here to register). As always, thank you for taking the time to read through our quarterly newsletter. Happy 4th of July and stay cool!

Best,

VSCC Co-Directors
Scott Zuckerman
Doug Terry
Andrew Gregory
Katie Gifford

VSCC Coordinator
Garrett Perry

What Does Vestibular RehabilitationFollowing Concussion Look Like

with Dr. Holly Cauthen, PT, DPT and Dr. Adam Meidinger, DPT, BS

Caring for athletes with concussion requires collaboration from many different specialties. We decided to highlight the role that physical therapists play in concussion care and rehabilitation, specifically through vestibular rehabilitation. We had the pleasure of interviewing Dr. Holly Cauthen, PT, DPT (left) and Dr. Adam Meidinger, DPT, BS (right) who work tirelessly to care for those suffering from sports-related concussions. Below you will find introductions for our two providers as well as their responses to our interview questions.

Dr. Cauthen received her Doctor of Physical Therapy from the University of South Alabama and went on to start her career in a neuro/vestibular clinic. She was able to spend 3 years working under the mentorship of a vestibular specialist and soon became a Vestibular Physical Therapist herself after earning her Susan Herdman Vestibular Competency Certification. Dr. Cauthen started working at Vanderbilt in 2014 as a Vestibular Physical Therapist and refers to her current position as her "dream job".

Dr. Cauthen works within Vanderbilt's Pi Beta Phi Rehabilitation Institute and spends the day treating patients with vestibular difficulties. For concussions, Dr. Cauthen specializes in oculomotor and gaze stabilization impairments. Treatments for patients often include eye exercises, challenging the vestibular system with high level balance activities, dual cognitive/physical tasks, and decreasing sensitivity to visual disturbance.

Dr. Cauthen: *"Vanderbilt Concussion Clinic encourages continuous interdisciplinary collaboration to ensure patients are receiving a gold standard level of care. Each patient's plan of care is individualized, comprehensive, and evidence-based from start to finish. I am extremely honored to be a part of this team!*"

Dr. Meidinger received his bachelor's in psychology and marketing. After spending a few years working professionally in banking and finance he decided to spend a summer in Nashville to reset before going back to school to pursue physical therapy. Dr. Meidinger received his Doctor of Physical Therapy from the University of North Dakota and completed a clinical rotation at Pi Beta Phi (where Dr. Cauthen works) during his last year of physical therapy school.

Dr. Meidinger: *"It was during my first student rotation that I learned more about Vanderbilt, and it became a goal to someday work for this great institution*"

Dr. Meidinger works in Vanderbilt's Orthopedic Clinic with a primary role in helping patients navigate their return-to-play/return-to-activity side of concussion recovery. He is proud that Vanderbilt's care aligns directly with clinical practice guidelines for physical therapy care in concussion recovery. In addition, Dr. Meidinger and his team of physical therapists use other evidence-based and expert clinician-backed treatment (e.g., vestibular, cervical, and other treatments) to provide holistic care to their patients.

While Drs. Cauthen and Meidinger are both physical therapists working with concussion patients, their jobs differ greatly, as physical

As providers who see concussions on a daily basis, we were interested to see what they thought was the most important thing for

therapists have the ability to work in various clinical settings depending on their specialties and interests. Therefore, we asked Dr. Cauthen and Dr. Meidinger to explain their typical workday.

Q: "Can you give us an idea of what your day-to-day jobs look like?"

Dr. Cauthen: "*My day-to-day life at Vanderbilt is 100% vestibular, that may include concussions, vestibular migraines, unilateral/bilateral vestibular weaknesses, dizziness and general imbalance. I would say about 25% of my cases are concussions."*

Dr. Meidinger: "*I'm a part of the general orthopedic team, so I see everything. I will see any orthopedic diagnosis that walks through the door as well as concussion on top of that. So, my day could range from an ankle sprain to an ACL surgery, to a total knee or total hip, to a shoulder, neck, or back pain."*

Although these jobs may seem different, Drs. Cauthen and Meidinger provide care for concussion patients together by focusing on their strengths in rehabilitation techniques. Dr. Meidinger focuses on running patients through a gamut of interventions including those that target visual and vestibular issues, autonomic and exertional tolerance, cervical contributors, and basic movement dysfunctions, such as balance. Dr. Cauthen specializes in complex vestibular cases that patients present with.

Dr. Cauthen: *"Adam and I actually work extremely well together, we are both really good at knowing our areas of expertise"*

A common tool used to detect concussion signs and symptoms is the Vestibular Ocular-Motor Screening Tool (VOMS). The VOMS was created in 2014 and is a common test for detecting vestibular dysfunctions post-concussion. We asked Drs. Cauthen and Meidinger if they could better explain the VOMS and how it is used in concussion care.

parents and athletes to know about concussions.

Q: "What is one thing about concussions that you wish every athlete and parent knew?"

Dr. Cauthen: *" When treating athletes with history of multiple concussions, I always say 'when you've seen one concussion, you've seen one concussion'. Just because you've had a concussion in the past doesn't mean current treatment is going to be as bad or your recovery is going to be as slow. Every injury and plan of care will vary in intensity and duration."*

Dr. Meidinger*: "I totally agree, I don't know who said it but, 'concussions are like snowflakes, they are never the same'. There's just no consistency between how severe the concussion is and it's recovery time. If everybody was more familiar with the scope and variability in concussion recovery, I think it would put them at ease a little bit."*

After discussing current practices for concussions and vestibular rehabilitation we inquired about changes that have occurred since Dr. Cauthen and Dr. Meidinger first started working as physical therapists.

Q: "How has concussion care and rehabilitation changed over the course of your career?"

Dr. Meidinger: *"For me, it's becoming more knowledgeable. I'll admit , I was pretty naïve when it came to concussion when I completed my training. Concussions weren't talked about as much, we didn't cover it in school, I knew there were return to play guidelines, but they were always handled by athletics and the athletic trainers. At this point, concussion protocols are being rewritten every year because important data is being published so fast."*

Dr. Cauthen: "*It has been such a learning curve regarding how much the mental and psychological components influence recovery. Interdisciplinary care within our program has proven to be extremely beneficial. Specifically, when there is an underlying psychological or*

Dr. Cauthen: *"The VOMS is specifically designed to screen for vestibular and oculomotor impairments. Benefits include the need for very little equipment and only 5-8 minutes of the clinician's time. In the outpatient setting, this tool is used in addition to other tests and measures to help guide treatment. Areas of impairment and/or symptom provocation are easily identified, and exercises can be tailored accordingly for a quicker recovery."*

Dr. Meidinger: "*VOMS testing is broken down in to two parts. The first part examines eye movement function for either abnormalities or symptoms related to eye/visual tracking, eyes jumping from target to target, and eyes converging to see things near and far from us. The second part examines the vestibular system by looking for abnormalities in visual and head movement reflexes and sensitivity to head movements. These systems are very commonly affected after a concussion; abnormalities in their function or sensitivity to functioning can cause a host of other down-stream symptoms that can inhibit patient's day-to-day functioning. The VOMS allows us to systematically look at individual pieces and parts and how patients feel doing these tasks so that we can assign specific exercises to address dysfunction or desensitize symptoms with the goal of improving patients' everyday life."*

mental component that hasn't been addressed. Tackling co-occurring emotional issues often allows an athlete who has plateaued in PT to continue to get better."

The literature surrounding concussion is ever changing, from updated evaluation tools to new treatment techniques. We asked our providers how they would like to see concussion care change in the future.

Q: "How would you like to see concussion care evolve in the future?"

Dr. Cauthen: *"I would like continued close collaboration. I feel like we've really started connecting together, working together, and appreciating what everyone has to bring to the table."*

Dr. Meidinger: *"I would love to see a centralized concussion center; we are so spread out which makes access for patients more difficult. If we had a central hub or even a little satellite hub with a few different disciplines, I think it would really improve accessibility and time to get people to focus on recovery."*

Working together is a core value of the Vanderbilt Sports Concussion Center. We are honored to have had the time to sit down with Drs. Cauthen and Meidinger to discuss their roles within the VSCC, concussion care, and vestibular rehabilitation.

Provider Spotlight: Tim Lee, MHS, MS, ATC

Tim Lee is our featured provider for this issue, and we are honored to highlight such a valuable member of the VSCC team. Tim has been an athletic trainer since 1994 and started working at Vanderbilt in 2012. After devoting almost 10 years to being the very first Coordinator for the Vanderbilt Sports Concussion Center, he transitioned into his current role as the Assistant Director for Sports Medicine in 2021. Tim has contributed countless hours serving as a physician extender and coordinating concussion treatment for the adult and pediatric care teams. During his time, he has witnessed many changes to the VSCC as well as in concussion care more broadly.

Tim has been a vital member of the Vanderbilt Sports Concussion Center since its origination in 2012, and we were honored for our own Kristen Williams (KW) to have had the opportunity to sit down and hear about his time at Vanderbilt.

KW: Who has been your mentor or someone you look up to in the field of athletic training or concussions?

TL: *"I had the pleasure of working closely with Dr. Gary Solomon for 8 years. He taught me so much about sport-related concussions. He was a tireless researcher and a dedicated clinician. He knew the importance of connecting with the athletes that he treated and building trust. Most importantly, he was a good dude."*

KW: What is one thing about caring for sport-related concussions in athletes you would like the public to know?

TL: *"Your concussion needs to be managed properly by a specialist who understands the injury and can perform a proper evaluation of the appropriate systems. We have a lot of complex concussion patients who show up in our clinic 3 months post-injury after having been mismanaged or not managed at all. If we could see these patients initially, we could identify their difficulties early and get them the appropriate interventions"*

KW: Since you have held an important role in VSCC since its conception, can you tell us

KW: If you could choose 3 words to describe your approach to athletic training and caring for athletes with concussion, what would they be?

TL: *"**Empathy**- it's never convenient to get hurt. Athletes want to play, and it can be a blow to tell an athlete they tore an ACL or are dealing with a concussion that will take time to recover from. **Education**- athletes need to understand their injury, they need to understand their healing process, and they need a game plan to getting back to their sport. **Expectations**- athletes need to know that there is an expectation that they are working on improving their current condition. Whether they are healthy or injured. The expectation for the healthy athlete is that they are working on skills to improve their performance for their sport. The expectation for the injured athlete is that they are working toward getting better by following the advice of their healthcare provider and not partaking in activities that would hinder their recovery.*

KW: How have you seen concussion care change over the course of your career?

TL: *"Concussion care has changed drastically since the 90s. Early on in my career, we were only concerned with loss of consciousness. We had the grading scale back then. Grade 1 (mild),*

about your perspective on the history of VSCC and how it has changed over time?

TL*: "When the VSCC started out, we really had to build relationships with other providers and departments. Treating sport-related concussions requires an interdisciplinary approach. Dr. Allen Sills was great at promoting the VSCC and finding providers to help make us a more complete center. We have done a good job over the years maintaining and building on those original relationships. At the end of the day, we have providers who really care about our patients getting better. We have a lot of talented people who make the VSCC work. I really think the VSCC is in good hands, and I am excited to see what the future holds."*

2 (moderate), or 3 (severe). There was no return to learn or return to play guidelines. If an athlete "got his bell rung", we sat him out for a few minutes, did the Romberg test, checked his pupils, and made sure he knew where he was When he felt better, we sent him back in the game. Concussion care really started to change when Washington state passed the first concussion law in 2009. Since then, we have seen all 50 states pass concussion laws. Research and clinical discoveries have been significant in how we treat concussion and I only see that trend continuing"

Fun Facts:

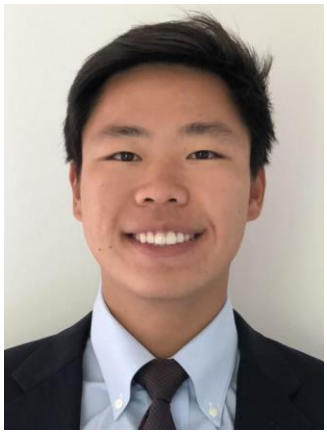
Originally from Ypsilanti, Michigan.

Enjoys golfing in his free time

Tim is married and has two daughters. His wife, Laurie, is a nurse practitioner. His oldest daughter, Harper is a sophomore in high school and plays basketball and golf. His youngest daughter, Hannah is in the 7th grade and plays the piano.

Research Corner

The VSCC would like to congratulate our third-year medical student, Alan Tang, on the recent acceptance of his manuscript. "Acute Cognitive Symptom Cluster Predicts Return-to-Learn Duration following a Sport-Related Concussion" to the Journal of Neurosurgery: Pediatrics.



Study Summary:

Adolescents sustaining sport-related concussion often experience difficulties with the return-to-learn (RTL) process. The study evaluated the relationship between initial acute cognitive symptoms following injury and RTL duration and found that the ratio of acute cognitive symptoms to total symptoms may predict and risk-stratify patients with increased risk for prolonged RTL.

Great job to Alan Tang and the co-authors (listed below) who made this possible. Keep an eye out for the full-length article in our future issue!

Alan R. Tang, BA
Philip J. Davis, BA
Kristen L. Williams, MS, LAT, ATC
Alan Z. Grusky, BA
Katherine S. Hajdu, BS
Brian Q. Hou, BA
Aaron M. Yengo-Kahn, MD
Scott L. Zuckerman, MD, MPH
Douglas P. Terry, PhD

VSCC Return to Learn Following Concussion

Return to learn (RTL) following concussion is a crucial step in recovery. Given that most athletes are also students, RTL guidelines should be a standard practice. RTL recommendations may vary in regards to the proper timeline for returning to the classroom, the appropriate accommodations that should be used, and the incorporation of cognitive activities as interventions during recovery. Providers at the Vanderbilt Sports Concussion Center have worked together to develop a return to learn protocol to assist athletes and parents with navigating this process.

Below is the VSCC's recommendations for a 6 stage return to learn protocol. Each phase includes a description of the phase, recommendations for activities that should be 'permitted', 'limited' and 'avoided', and guidelines on when to progress to the next phase. We hope that by providing this guidance to student athletes and parents that the return to learn process becomes a more systematic and successful process.

VANDERBILT UNIVERSITY MEDICAL CENTER

Vanderbilt Sports Concussion Center

Return to Learn (RTL) Protocol

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STAGE	DESCRIPTION	RECOMMENDATIONS	PROGRESS
1	**Physical and Cognitive Rest** Focus on rest. Try to limit strenuous activities for the first 48 hours after injury.	*Permitted* • Activities that do not increase heart rate. • Board games, crafts, talking on phone. *Limit* • Screen time. • TV, video games, texting, reading, computer. *Avoid* • Activities that cause mental strain or increased heart rate. • School work, sports, work, driving.	*Move to the next stage when:* Symptoms improve OR After 2 days of rest
2	**Light Cognitive Activity** Gradually increase cognitive activity. Start schoolwork and other mentally strenuous activities.	*Permitted* • Previous tasks plus reading, drawing, TV, easy homework assignments • Peer contact & social networking. *Limit* • Working on tasks for more than 30 minutes without a break. *Avoid* • Activities that significantly increase heart rate. • Activities that increase symptoms above a 6/10.	*Move to the next stage when:* 1 hour of cognitive activity per day can be tolerated (in 30-minute blocks).
3	**Return to School- Partial Days** Return to school for partial days, attend at least half of your classes. Take breaks through the day.	*Permitted* • Attend 2, then 3, then 4 classes/day. • Plan several 10-15 minute breaks throughout day. • Academic accommodations. • Complete school work at home. *Limit* • Working for more than 60 minutes without a break. *Avoid* • Tests (regular classes or standardized). • Participation in P.E., recess, sports. • Activities that increase symptoms above a 6/10.	*Move to the next stage when:* 2 hours of cognitive activity per day can be tolerated (in 30-45-minute blocks).
4	**Part Time School- Moderate Accommodations** Continue attending school part time, increase classroom time. Take less breaks.	*Permitted* • Increase school attendance. • Decrease breaks. • Try to complete all homework tasks. • Limit accommodations. • Begin quizzes. *Limit* • Working for more than 60 minutes without a break. • Difficult classwork. *Avoid* • Tests (regular classes or standardized). • Participation in P.E., recess, sports (but attending/watching practice is permitted).	*Move to the next stage when:* 4 hours of cognitive activity per day can be tolerated (in 45-60 minute blocks). Minimal accommodations needed.
5	**Full Time School- Minimal Accommodations** Attend school full time with minimal accommodations	*Permitted* • Attend all classes. • Begin classroom testing. • Complete all homework assignments. *Limit* • Accommodations at school. Gradually decrease extra time, etc. • Number of tests in a day. *Avoid* • Standardized tests. • Participation in P.E., recess, sports (but attending/watching practice is permitted).	*Move to the next stage when:* Full day of school can be tolerated with minimal accommodations.
6	**Full Time School- No Accommodations** Return to all classes with no accommodations	*Permitted* • Attend all classes with no accommodations and complete all homework. *Avoid* • Full participation in P.E. or sports until return to sport protocol has been completed and medical clearance is provided.	Focus on Return to Play Protocol!

Important Notes

- Cognitive activity ("brain work") is not dangerous, cannot injure/re-injure the brain, or make overall recovery worse.
- If you experience mild worsening of symptoms during the task (e.g., an increase in a symptom 2 points on the 0-10 symptom scale), continue with the task. If your symptom increases more than 2 points, take a short break and try the activity again later.

Student Spotlight: Kate Hajdu

Kate Hajdu a third-year medical student at Vanderbilt University, is a valuable member of the V-SCoRe research team.
Kate joined the team during the middle of her first year of medical school, when she realized the variability in concussion recovery. Kate has a personal interest in athlete safety and has a desire to discover new ways to protect athletes and improve outcomes. Since joining the VSCC, Kate has helped with several projects related to concussion recovery and has been a contributing member of our team. Our own Kristen Williams (KW) sat down with Kate to learn more about her experiences with V-SCoRe.

KW: What was something about V-SCoRe that caught your attention?

KH: "*The mission statement of the V-SCoRe research lab specifically focuses their efforts on sport-related concussion and keeping athletes healthy. The VSCC inspires and fuels many of the research questions and topics we investigate and has an exciting partnership with the Vanderbilt University Athletics, the Nashville Predators, the Nashville Sounds, the Nashville Soccer Club, and local Nashville Metro Schools. This is the patient population I am interested in learning more about. In addition, the amazing mentorship offered by this lab will help me develop research skills I can carry forth in medical school, residency, and beyond.*"

KW: What is the most valuable lesson you've learned so far working with V-SCoRe?

KH: "*The most valuable thing I've learned since being in this lab is how to work effectively as a team to answer a research question. When all the people you are working with have the same goal and are operating under great leadership like we do at the V-SCoRe Lab, it helps make big projects come to fruition and helps generate meaningful data that can be applied to clinical practice*."

KW: Why did you want to get involved with V-SCoRe?

KH: "*I wanted to get involved with V-SCoRe because as an athlete I saw several of my friends suffer from concussions. There was a lot of variability in recovery, and I wanted to discover more about what we could do to protect athletes and improve their outcomes*."

KW: How has V-SCoRe impacted your medical education?

KH: "First and foremost*, the V-SCoRe lab has helped by giving me a large leg up in my knowledge of clinically evaluating and treating concussions. It has also helped advance some research skills early in my medical school career such that I am more prepared for my research immersion project taking place during my third and fourth year*."

Fun Facts:

From Dallas Texas.

Kate played soccer growing up. Her team won a national championship in high school and she went on to play at Texas A&M where her team won the SEC championship during her junior year.

Kate is a huge coffee fan and likes to frequently explore coffee shops around Nashville on the weekends.

Using the Guardian Cap and Mouthguards as Accelerometers

Scott Zuckerman, MD, MPH and Douglas Terry, Ph.D,

The NFL has adopted a new technology to make practice safer known as the Guardian Cap – an add-on device worn over the football helmet that has been shown to reduce the magnitude of a football head impact. Researchers and clinicians continue to try to develop ways to prevent concussions and make contact sports safer. While researchers have addressed areas of safety such as game rules and proper technique, the Guardian Cap is a type of improved equipment that many think will lead to safer practice. The Guardian Cap has been around for many years, and while the first iteration was not as successful in reducing head impacts, the second version appears to have made major improvements.

The Guardian Cap is now being worn by all NFL offensive and defensive linemen, tight ends, and linebackers from the start of the training camp contact period to the second preseason game.[1] The theory behind the Guardian Cap is that an external pad increases the overall thickness of the overall padding system (i.e., both inside and outside of the helmet), which can absorb additional force and subsequently reduce the amount of force that is transmitted to the head and brain.[2]

A recent study from the Annals of Biomedical Engineering showed that the Guardian Cap resulted in a 10% reduction in severity of impact transmitted to the player's head, and at least 20% reduction if both players in a collision are wearing it.[3] The use of the Guardian Cap at the highest level of football represents a major change in how practices are conducted. Time will tell if the Guardian Cap becomes mandatory at the collegiate, high school, and youth level, or if it even becomes recommended for game use.

References

1. Seeking to reduce head contact, NFL mandates use of Guardian Cap helmet for early portion of training camp. Accessed June 20, 2022. https://www.espn.com/nfl/story/_/id/33620788/seeking-reduce-head-contact-nfl-nflpa-mandate-use-guardian-cap-helmet-early-portion-training-camp
2. Breedlove KM, Breedlove E, Nauman E, Bowman TG, Lininger MR. The Ability of an Aftermarket Helmet Add-On Device to Reduce Impact-Force Accelerations During Drop Tests. *J Athl Train*. 2017;52(9):802-808. doi:10.4085/1062-6050-52.6.01
3. Bailey AM, Funk JR, Crandall JR, Myers BS, Arbogast KB. Laboratory Evaluation of Shell Add-On Products for American Football Helmets for Professional Linemen. *Ann Biomed Eng*. 2021;49(10):2747-2759. doi:10.1007/S10439-021-02842-8

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