VANDERBILT UNIVERSITY MEDICAL CENTER

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Vanderbilt Sports Concussion Center • Research

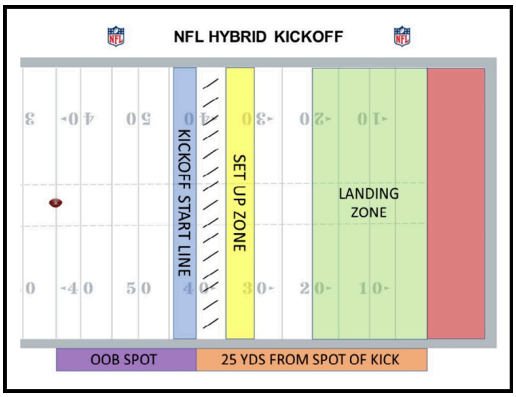
VANDERBILT SPORT CONCUSSION CENTER
QUARTERLY NEWSLETTER
Winter 2025

Screen Time: Does it Impact Recovery from Concussion?

Can increased screen time following concussion impact recovery? Read our take here!

New National Football League (NFL) Rules

We discuss the new NFL rule changes that took effect in 2024.



Years of Ice Hockey Play and Risk of Chronic Traumatic Encephalopathy

See our review of a recent study out of Boston University examining CTE in ice hockey players.

Providers Spotlight

This issue's spotlight features Dr. Douglas Terry, PhD, ABPP-CN.

Student Spotlight

Our student spotlight highlights third year Vanderbilt Undergraduate Student: Sam Fitch.

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Research Corner

Check out some of the latest work being done in the Vanderbilt Sports Concussion Center!

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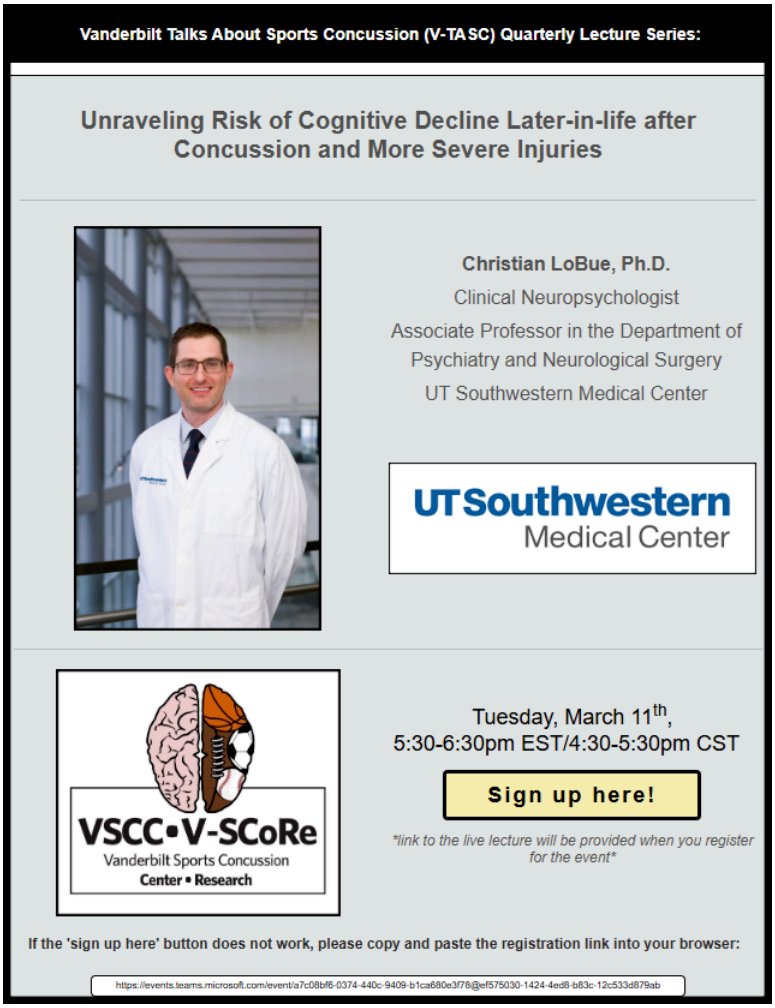
@VUMC_Concussion	vumc.org/vscc-research	Sign-Up Here	vscc@vumc.org

Upcoming Events



V-TASC Lecture: March 11th, 2025

Our next upcoming quarterly lecture series will feature speaker Dr. Christian LoBue!

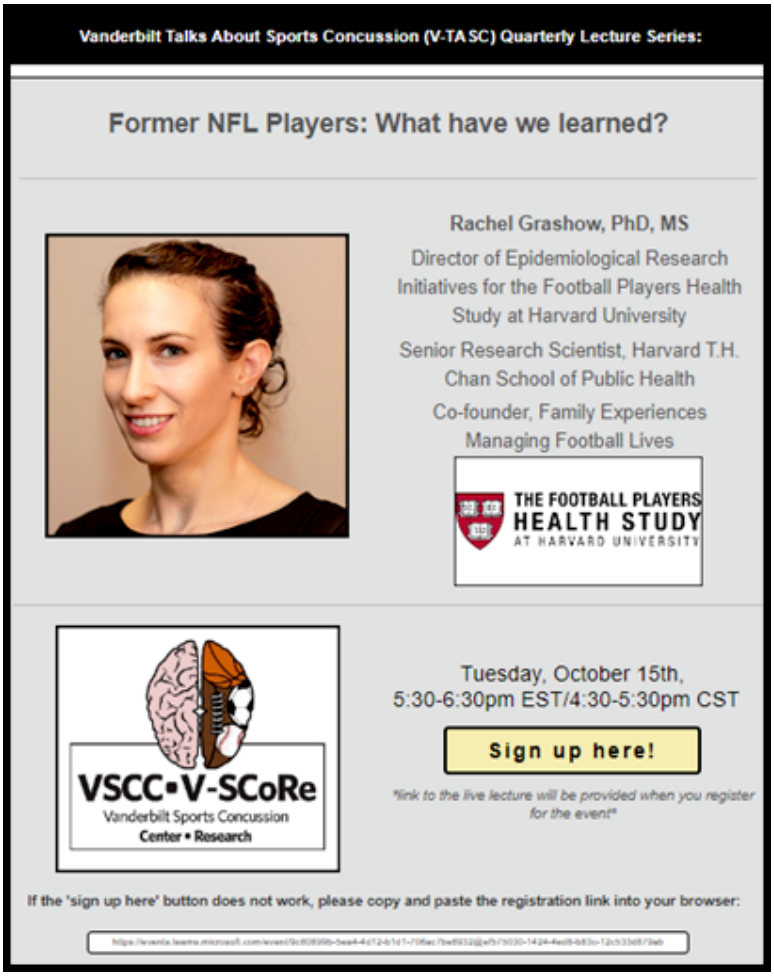
Be sure to register for the event here!

Recent Events

Subscribe to our email list.

V-TASC Lecture: October 15th, 2024

Our most recent quarterly lecture featured speaker Dr. Rachel Grashow, PhD, MS. If you missed the lecture, you can view it on our website here!



Co-Directors' Message

As 2025 begins, we're looking forward to continuing to serve the greater Nashville area with world-class concussion care from our multi-disciplinary team. As always, we have a variety of ongoing research projects and continue to train undergraduates, medical students, and residents in this area. We are planning a series of lectures as part of our Vanderbilt Talks about Sport Concussions (V-TASC) series and hope you can join!

From your co-directors -
Scott, Doug, and Andrew

2024 National Football League Rule Changes

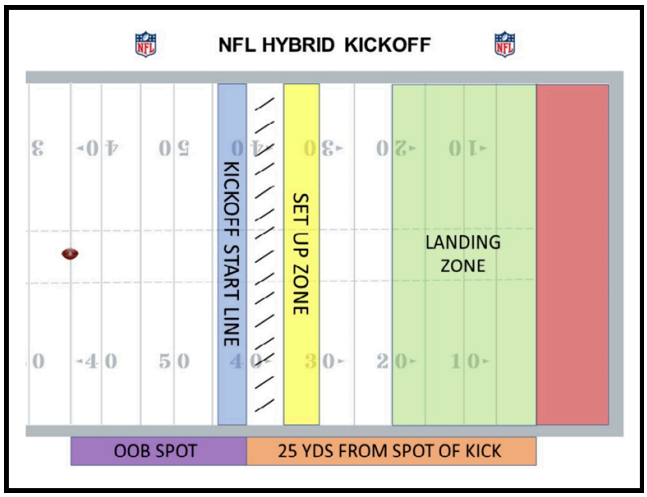
Kristen Williams

The inherent risk of injury, particularly in contact and collision sports like football, is a well-known concern among athletes, parents, and coaches. As awareness of these risks has grown,

example, advancements in protective equipment and the implementation of safety-focused rule changes have played a significant role in lowering injury risk. These efforts are showing promising results with a decline in injury rates, particularly concussions.

The NFL, which began tracking injury rates in 2015, recently announced the lowest number of concussions in nine years during this year's preseason practices and games.[1] Notably, concussions among players wearing the Guardian Cap dropped by 50% compared to the pre-mandate average.[2] The Guardian Cap is a soft-shell pad that attaches to the exterior of a football helmet and is designed to reduce impact forces. Data has shown that collisions result in a 20% reduction in impact force when both players wear it and a 10% reduction if only one player wears it.[3] While the Guardian Cap was first introduced to the NFL in 2015, its use became more popular during the 2022 training camps and became mandatory in 2023 for certain high risk positions (e.g., running backs, linemen, and linebackers).[3] In 2024, players were permitted to wear Guardian Caps optionally for the first time during regular-season games. The implementation of the Guardian Cap has shown significant success in reducing concussion rates at the professional level and has prompted its adoption at the collegiate level, broadening its use in football programs nationally.

In a further effort to increase player safety and reduce injury rates, additional rule modifications were implemented within the NFL this year:



New Dynamic Kickoff Rule:

During kickoff, the kicker will now line up at the 35-yard line while the rest of the team lines up along the receiving team's 40-yard line. The receiving team can have two returners inside of the 20-yard line or the "landing zone," while the remainder of the receiving team lines up at the 35-yard line. The primary goal of this rule change is to restrict movement, encourage returns, and reduce player space and maximum speed during kickoffs.[4]

Removal of the "hip-drop tackle" from the game:

A "hip-drop tackle" occurs when a defender grabs a ball carrier with both hands or wraps up a ball carrier with both arms while rotating or swiveling his hips, unweighting himself and dropping onto the ball carrier's legs during the tackle. This now results in a 15-yard penalty. The primary goal of this change is to eliminate a potentially dangerous tackling technique and reduce the risk of lower extremity injuries.[4]

1.NFL's prioritization of player safety leads to promising injury data for 2023 season. NFL.com. Accessed December 30, 2024. https://www.nfl.com/news/nfl-s-prioritization-of-player-safety-leads-to-promising-injury-data-for-2023-season
2. Hansen K. Guardian Sports - NFL Player Health & Safety Data. Guardian Sports. October 30, 2024. Accessed December 30, 2024. https://guardiansports.com/2024/10/30/nfl-player-health-and-safety-guardian-caps/
3. What are Guardian Caps? How are they used in the NFL? ESPN.com. September 17, 2024. Accessed December 30, 2024. https://www.espn.com/nfl/story/_/id/40909583/what-guardian-caps-how-used-nfl
4. 2024 NFL Rules Changes | NFL Football Operations. Accessed December 30, 2024. https://operations.nfl.com/the-rules/rules-changes/2024-rules-changes/

Provider Spotlight: Douglas Terry, Ph.D., ABPP-CN

We are honored to highlight Dr. Douglas Terry in this issues provider spotlight. Dr. Terry is a board certified clinical neuropsychologist and a Co-director at the Vanderbilt Sports Concussion Center as well as the Senior Director of Research for the National Football League (NFL). Dr. Terry moved to Nashville from Boston in 2021 to help spearhead concussion clinical care and research at Vanderbilt.
Our own Kristen Williams (KW) had the opportunity to sit down and hear about his time at Vanderbilt and experience with treating concussion.

KW: Can you tell us about some of the research you are doing?

DT: *"At any given time, we have over 20 projects being worked on. These projects tend to fit into four large buckets, (1) studies about the diagnosis of concussion. For example, 'Can certain technological devices detect a concussion just as good as a clinician?' (2) Studies from the clinical notes from our patients. For example, 'Do certain clinical characteristics (like poor sleep right after the concussion) predict a longer recovery time?' (3) Studies using instrumented mouth guards in football players. Currently, we are working with the NFL and Vanderbilt University football such that football players are wearing mouth guards that have sensors embedded in them to detect head impacts. (4) Studies about the potential long-term effects of contact sports and concussions."*

KW: How have you seen concussion care evolve since the beginning of your career?

DT: *"It's gotten a lot more active. I used to tell people to rest all the time, then, we realized that prolonged rest isn't helpful. A concussion tends to benefit form a more active rehab style. Not only is this approach associated with better outcomes than prolonged rest, it's also a lot more palatable to the athlete since being in a dark room or not being allowed to do anything is boring and can trigger depression."*

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

DT: *"I recommend that people learn about concussions and concussion treatment from health care providers directly. If you have questions, seek help. Often, the things that make it into mainstream media are uncommon and atypical, and these things may not represent the majority of people's experiences with concussion."*

KW: How have you seen the VSCC change, and where do you see us going in the future?

DT: *"I've loved seeing a variety of others - from students to other healthcare providers in the VUMC system - get involved in concussion research. It's something I'm passionate about and I'm glad to see that others are as well."*

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

DT: "*Enthusiastic, Optimistic, and Evidence-Based."*

Fun Facts:

- Dr. Terry is originally from eastern Long Island.
- He enjoys music and theater

Years of Ice Hockey Played and Risk of Chronic Traumatic Encephalopathy

Kristen Williams

The long-term impacts of contact sports are a constantly growing topic in the media. While football often dominates this focus, other high-impact sports, such as ice hockey, expose athletes to numerous head impacts every year. As such, the long-term consequences of participating in hockey should be studied with equal importance and warrant the same attention. A potential risk of contact sport exposure is Chronic Traumatic Encephalopathy, or CTE. While the majority of CTE research has focused on football players, a recent study from Boston University turned its attention to ice hockey players. This study sought to examine the relationship between the duration of ice hockey play and both the diagnosis and severity of CTE.[1]

What is CTE?

CTE is characterized by the abnormal accumulation of the protein “tau” in a specific region of the brain,[2] although an official diagnosis can only be made post-mortem during an autopsy. Although it is commonly believed that CTE is directly linked to sport-related head impacts or concussions, that is not always the case. Ongoing research efforts seek to improve our understanding of the factors contributing to its development, emphasizing the value of exploring the risk of CTE across multiple sports, including ice hockey.

Study Overview and Findings:

This study was conducted using brains donated to the Understanding Neurological Injury and Traumatic Encephalopathy (UNITE) and Framingham Heart Study (FHS) Brain Banks (links to their

participation ranging from the youth to professional level. Of these 77 donors, 42 were diagnosed with CTE. Below is some additional, information about the cohort and findings:

- The most common cause of death was suicide (28.6% with CTE, 28.6% with no CTE) followed by neurodegenerative disease (26.2% with CTE, 22.9% with no CTE).	- CTE rates by level of play NHL: 18/19 (~95%). College, Juniors, and Semiprofessional players: 13/28 (~46%). Youth and high school players: 2/21 (~10%).	- Of the 22 enforcers in the cohort, 18 were diagnosed with CTE. (See “Hockey Facts” below to learn what this role does!)	- CTE rates by years played <13 years of play: 5/26 (~19%). 13-23 years of play: 14/27 (~52%). >23 years of play: 23/24 (~96%).

The study’s findings indicate an association between a greater number of years spent playing ice hockey and an increased likelihood of developing CTE, as well as an increase in phosphorylated tau (p-tau) in the brain. These findings persisted even after adjusting for factors such as age at death, participation in other contact sports, age of first exposure to hockey, total number of concussions, and player position.

These results may demonstrate the importance of understanding the potential long-term neurological impacts of playing ice hockey. However, it is important to remember that this sample may have an element of *selection bias* – such that only athletes who are concerned about their brain health and/or are symptomatic while living donate their brains for this research, while less concerned / non-symptomatic people may not engage in brain donations after death. Therefore, it is important not to generalize these results to all hockey players, especially younger athletes, as only 10% of the study were youth and high school hockey players.

Nonetheless, it is essential to educate players, parents, and other related personnel about the risks for informed decision-making and potential safety improvement of the sport. Additional studies are needed to validate these findings and provide further reasoning for enhanced safety protocols and potential rule modifications to protect ice hockey athletes at all levels of play.

Brain Bank Links

Understanding Neurological Injury and Traumatic Encephalopathy (UNITE) Brain Bank

Framingham Heart Study (FHS) Brain Bank

Hockey Facts

Among youth hockey players, there is a 3-fold increased risk for head injuries in leagues permitting body checking compared to leagues not permitting body checking.[3]

USA Hockey reports that over 500,000 players registered to play during the 2023-2024 season.[5]

Enforcers have an unofficial role at the elite level to react aggressively to perceived violent or dirty play, often initiating physical fights against offenders. These players are sometimes called "goons" or "fighters." Research indicates that enforcers die an average of 10 years earlier than their nonenforcer counterparts.[4]

1.Abdolmohammadi B, Tuz-Zahra F, Uretsky M, et al. Duration of Ice Hockey Play and Chronic Traumatic Encephalopathy. *JAMA Netw Open*. 2024;7(12):e2449106. doi:10.1001/jamanetworkopen.2024.49106
2. McKee AC, Stein TD, Kiernan PT, Alvarez VE. The Neuropathology of Chronic Traumatic Encephalopathy. *Brain Pathol*. 2015;25(3):350-364. doi:10.1111/bpa.12248
3. Emery CA, Kang J, Shrier I, et al. Risk of injury associated with body checking among youth ice hockey players. *JAMA*. 2010;303(22):2265-2272. doi:10.1001/jama.2010.755
4. Popkin CA, Morrissette CR, Fortney TA, McCormick KL, Gorroochurn P, Stuart MJ. Fighting and Penalty Minutes Associated With Long-term Mortality Among National Hockey League Players, 1967 to 2022. *JAMA Netw Open*. 2023;6(5):e2311308. doi:10.1001/jamanetworkopen.2023.11308
5. Membership Statistics. Accessed January 7, 2025. https://www.usahockey.com/membershipstats

Research Corner

We would like to take a moment to recognize the work that our team has accomplished over the last few months and share a few of our recently accepted manuscripts.

Congratulations to all authors!

Click the picture or link to access the full-length article.

Initial Symptom Severity and Recovery of Sport-Related Concussion in Team Versus Individual Sport Athletes. Long CC, Dugan JE, Jo J, Williams KL, Jonzzon S, Terry DP, Yengo-Kahn AM, Zuckerman SL. 2024. *Neurosurgery*. DOI: 10.1227/neu.0000000000003225. PMID: 39431780.

Social Demographic and Clinical Predictors of Time to Clinic Presentation After a Sport-Related Concussion. Amedy A, Williams K, Prosak OL, Anesi T, Zuckerman SL, Terry DP. 2024. *Clinical Journal of Sports Medicine*. DOI: 10/1097/JSM.0000000000001290. PMID: 39526894.

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The Role and Benefit of Physical Therapy Following Sport-Related Concussion. Bishay AE, Godwin SL, Jo J, Williams KL, Terry DP, Zuckerman SL. 2024. Journal of Sports Rehabilitation. DOI: 10.1123/jsr.2024-0017. PMID: 39561761.	**Comparative Analysis of Sport-Related Concussion: How Do 8-12-Year-Old Athletes Differ from 13- to 17-Year-Old Athletes?** Zargari M, Jo J, Williams K, Yengo-Kahn AM, Vance EH, Bonfield CM, Zuckerman SL, Terry DP. 2024. *Journal of Neurosurgery Pediatrics*. DOI: 10.3171/2024.8.PEDS24295. PMID: 39270313.
Symptoms of Traumatic Encephalopathy Syndrome are Common in Community-Dwelling Adults. Terry DP, Bishay AE, Rigney GH, Williams KL, Davis P, Jo J, Zuckerman SL. 2024. *Sports Medicine*. DOI: 10.1007/s40279-024-02029-w. PMID: 38687442.	**Does Mechanism of Injury Affect Recovery After Sport-Related Concussion in Basketball? A Pilot Study.** Bishay AE, Albert AN, Rigney GH, Corley JT, Williams KL, Jo J, Terry DP, Zuckerman SL. 2024. Neurosurgery. DOI: 10.1227/neu.0000000000003175. PMID: 39283093.
What are the Protocols and Resources for Sport-Related Concussion Among Top National Collegiate Athletic Association Football Programs? A Cross-Sectional Survey of A5 Schools. Clugston JR, Diemer K, Chrabaszcz SL, Long CC, Jo J, Terry DP, Zuckerman SL, Fitch RW. 2025. Clinical Journal of Sports Medicine. DOI: 10.1097/JSM.0000000000001241. PMID: 38975931.	**Age of First Exposure to Contact Sports Is Not Associated With Worse Later-In-Life Brain Health in a Cohort of Community Dwelling Older Men.** Jo J, Wong G, Williams KL, Davis PJ, Rigney GH, Zuckerman SL, Terry DP. 2024. Clinical Journal of Sports Medicine. DOI: 10.1097/JSM.0000000000001251. PMID: 38990169.

Student Spotlight: Sam Fitch

Samuel (Sam) Fitch is a Junior undergraduate student at Vanderbilt University and has worked with the Vanderbilt Sports Concussion Center since his Freshman year. Sam hopes to become a physician in the future, and is interested in the fields of cardiology, neurology, or orthopedics. Sam has assisted with several research studies since he started with the VSCC and has grown tremendously as a researcher. Our own Kristen Williams (KW) sat down with Sam to learn more about his experiences with V-SCoRe.

KW: Why did you want to get involved with V-SCoRe?
SF: "My involvement in sports exposed me to concussions at an early age. As a young athlete, I witnessed several teammates during

KW: What is something valuable that you've learned about concussions?
SF: "One valuable thing I have learned about concussions is that recovery is based on a plethora of factors. The initial severity, number

since then, I wanted to have a greater understanding of concussions. There is still so much yet to be discovered about concussions, and I love that V-SCoRE strives to uncover this information to help create a safer environment for athletes."

KW: How has V-SCoRe impacted your education?
SF: "My time at V-SCoRe has been invaluable to my education. I have improved my proficiency in Excel, learned about the inner workings of the research process, and further developed my writing skills. I also have a greater understanding of statistics. In addition, I have learned the importance of integrity and professionalism while working with medical students and health care providers in V-SCoRe."

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injury during the season can impact the length of recovery."

KW: What is the most valuable thing you have learned so far working with V-SCoRe?
SF: "The most valuable thing I have learned so far is how to properly read and understand a scientific paper. Since I began working for V-SCoRe, my critical thinking skills specifically related to scientific writing have greatly improved."

Fun Facts

KW: What is something about you outside of medicine/science?
SF: "I love to play soccer, and I am the president of the Vanderbilt Men's Club Soccer team, I also volunteer as a practice player for the Vanderbilt Women's Division I team."

Sam played Soccer, Basketball, and Cross Country/Track growing up.

VSCC Projects

NFL Mouthguard Study
-Sam assisted with managing instrumented mouthguards within the Vanderbilt University Football Team.

Long-Term Follow Up of Concussion Patients
-A follow up survey of athletes evaluated in our concussion clinic examined long-term outcomes of experiencing a sport related concussion during adolescents.

New Concussion Definition Study
-This study examined the new American College of Sports Medicine (ACSM) concussion definition among our clinic patients.

CARE Consortium Seasonality
-Using the Concussion Assessment, Research and Education (CARE) concussion database we examined the idea of seasonality or "time in season" in which a concussion occurs.

BlinkTBI Device Studies
-This study utilized a Blink reflexometer to measure the blink reflex during baseline concussion testing in high school athletes.

High School Concussion Tracking
-In a new study we hope to examine trends in concussion presentation among high school athletes.

Gender and Recovery
-This study aims to examine differences in access to care between genders and its impact on recovery.

Does recovery after sport-related concussion vary by time point in a season? A multi-sport investigation

Screen Time: Does it Impact Recovery from Concussion?

Jai Horsey

Clinician recommendations for managing sports-related concussions (SRC) often focus on reducing the patient's symptom burden and severity through general strategies like cognitive and physical rest.[1] However, the prevalence of SRC[2] combined with the widespread use of modern technology[3] makes it worthwhile to explore the role that screen time may play in influencing a patient's post-concussion symptoms and recovery trajectory. Evidence suggests that *excessive* screen time in healthy individuals may negatively impact physical, behavioral, and mental health, especially in children and adolescents.[3–6] With approximately 70% of SRCs occurring in individuals aged 19 and younger[7] and many teenagers engaging in more than seven hours of daily screen time use,[8] additional investigation into the impact of screen time on concussion recovery is necessary. This research could provide clinicians with valuable insights fostering improvements in treatment and management protocols.

Expert consensus suggests that limiting screen time in the acute phases of concussion recovery is beneficial,[9] though evidence supporting this remains scarce. Presently, only two studies have directly explored the effects of screen time on concussion symptom presence and resolution. The first, published in 2021, found that individuals with unrestricted screen time experienced significantly longer symptom resolution times (median of 8 days) than those with restricted screen time (median of 3.5 days).[8] The second, published in 2022, found that screen time use of all time lengths, was associated with relatively more symptoms in those with concussions compared to orthopedic injuries, but other factors (e.g., time since injury, greater pre-injury cognitive and somatic symptoms, adolescent age, female sex) were more strongly linked to increased symptom severity.[10] The Concussion in Sport Group (CISG) held its 6th International Conference in 2022 to evaluate and summarize the latest evidence on various aspects of concussion management. Referencing the two prior studies and Leddy et al.'s,[9] the CISG concluded that limiting screen time during the first 48 hours post-injury may aid recovery; however, extending restrictions beyond this time may not offer additional benefits.[11]

Given the scarcity of evidence, it is challenging to draw definitive conclusions about screen time's role in concussion recovery. There are critical elements of screen time – such as usage habits and different screen types – that remain unexplored and warrant investigation. In the meantime, effective strategies to reduce screen time in individuals recovering from an SRC could include actively logging screen usage, scheduling "no-screen" periods throughout the day, disabling device notifications, creating screen-free zones within the home, generating new hobbies, and involving an accountability partner. Reducing screen time during the acute recovery phase of concussion represents a practical approach for clinicians and patients, but further research is needed to refine these guidelines in efforts to improve patient SRC recovery outcomes.

1. Schneider KJ, Leddy JJ, Guskiewicz KM, et al. Rest and treatment/rehabilitation following sport-related concussion: a systematic review. *Br J Sports Med*. 2017;51(12):930-934. doi:10.1136/bjsports-2016-097475

2. Gardner AJ, Quarrie KL, Iverson GL. The Epidemiology of Sport-Related Concussion: What the Rehabilitation Clinician Needs to Know. *J Orthop Sports Phys Ther*. 2019;49(11):768-778. doi:10.2519/jospt.2019.9105

3. Devi KA, Singh SK. The hazards of excessive screen time: Impacts on physical health, mental health, and overall well-being. *J Educ Health Promot*. 2023;12(1). doi:10.4103/jehp.jehp_447_23

4. Liu J, Riesch S, Tien J, Lipman T, Pinto-Martin J, O'Sullivan A. Screen Media Overuse and Associated Physical, Cognitive, and Emotional/Behavioral Outcomes in Children and Adolescents: An Integrative Review. *J Pediatr Health Care*. 2022;36(2):99-109. doi:10.1016/j.pedhc.2021.06.003

5. Santos RMS, Mendes CG, Sen Bressani GY, et al. The associations between screen time and mental health in adolescents: a systematic review. *BMC Psychol*. 2023;11(1):127. doi:10.1186/s40359-023-01166-7

6. Robidoux H, Ellington E, Lauerer J. Screen Time: The Impact of Digital Technology on Children and Strategies in Care. *J Psychosoc Nurs Ment Health Serv*. 2019;57(11):15-20. doi:10.3928/02793695-20191016-04

7. Coronado VG, Haileyesus T, Cheng TA, et al. Trends in Sports- and Recreation-Related Traumatic Brain Injuries Treated in US Emergency Departments: The National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) 2001-2012. *J Head Trauma Rehabil*. 2015;30(3):185-197. doi:10.1097/HTR.0000000000000156

8. Macnow T, Curran T, Tolliday C, et al. Effect of Screen Time on Recovery From Concussion: A Randomized Clinical Trial. *JAMA Pediatr*. 2021;175(11):1124. doi:10.1001/jamapediatrics.2021.2782

9. Leddy JJ, Burma JS, Toomey CM, et al. Rest and exercise early after sport-related concussion: a systematic review and meta-analysis. *Br J Sports Med*. 2023;57(12):762-770. doi:10.1136/bjsports-2022-106676

10. Cairncross M, Yeates KO, Tang K, et al. Early Postinjury Screen Time and Concussion Recovery. *Pediatrics*. 2022;150(5):e2022056835. doi:10.1542/peds.2022-056835

11. Patricios JS, Schneider KJ, Dvorak J, et al. Consensus statement on concussion in sport: the 6th International Conference on Concussion in Sport–Amsterdam, October

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