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Tucker Center for Research on Girls & Women in Sport

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The highest concussion rates for female athletes in high school and college occur in ice hockey, soccer, and basketball.

Female Athletes and Concussions: The Untold and Unexamined Story

Introduction: What do Olympic gold medal skier Lindsay Vonn, NHL star Sidney Crosby, and MLB Twins' player Justin Morneau have in common? If you said they have all had to cease competing due to sports-related concussions, you would be correct. The issue of sport concussions is a hot topic in the news from youth sports, to updates on high-profile pro athletes, to the NFL's controversial and much-debated decision to enforce new safety rules for players. In spite of much media coverage and public debate, one factor has been missing from our discussions—the impact of concussions on female athletes. As we now know, previous patterns of scholarly inquiry and public discourse often failed to examine how one's gender might influence sports participation or was not deemed all that relevant. And in far too many cases, it was assumed that data collected on male subjects could be directly applied to females.

Contemporary scholars have critiqued this past approach as not only problematic and flawed, but in some cases, even dangerous. It is interesting (not to mention troubling) that eerily similar patterns, attitudes, and belief systems are alive and well within the scientific community when it comes to female athletes, traumatic brain injury, and sports-related concussion. In this feature story we have invited perspectives

from three noted scholars on what is known about female athletes and concussions in order to push the public discussion and research agenda forward in productive and meaningful ways. We finish the piece with a perspective from a female student-athlete.

Definition, Description and Surveillance: *Professor Diane Wiese-Bjornstal, School of Kinesiology, U of M; Association of Applied Sport Psychology Certified Consultant.* Concussions are mild traumatic brain injuries (MTBIs) that lead to changes in how the brain functions. They range from mild to severe, and can result from direct blows to the head, as well as from back and forth “whiplash” movements of the head following body contact. Coaches, parents, and teammates who observe athletes sustain these types of jarring hits should be alert for changes in an athlete's functioning or behavior. In particular, they should look for an athlete losing consciousness, moving clumsily, or appearing dazed, confused, or forgetful. They should also ensure the athlete's immediate removal from play and prompt examination by health care professionals. For more information about concussion symptoms and resource information, read the *Did You Know?* box on page 4.

Surveillance evidence indicates that about 9% of all sports injuries to high-school athletes and about 5% of all intercollegiate sports

“Concussions” continued on page 2

Letter from the Director

Greetings from the Tucker Center! In this newsletter you will learn about all of the exciting and award-winning endeavors we've been up to since last Fall. You will also get a sneak preview of what we are planning for in the coming months. At the heart of our mission is engagement in interdisciplinary research.

We rely on thoughtful and critical examination to advance our knowledge regarding how sport and physical activity impact the lives of girls and women in a variety of settings. Faculty and graduate students affiliated with the Tucker Center seek answers to the most significant and compelling issues facing the world of women's sports. Toward that end, our Spring Distinguished Lecture will focus on a critical and under-examined topic—female athletes and concussion. We've invited three nationally recognized experts who are at the cutting edge of research in this area. They will address what is known about the impact of concussions on athletic females, as well as highlight the numerous gaps in the research literature ranging from neuroscience to sport psychology. They will also focus their remarks on strategies related to education and prevention. You can read more about the Distinguished Lecture and the panelists on page 4. To get a glimpse of their perspectives in advance of the lecture, read the feature story here in the columns to the left. In that same story we invited former Gopher hockey player Kelli Blankenship to share what it was like for her to deal with the painful and often scary consequences of sport-related concussions.

The Kudos and Announcements column on page 3 highlights our numerous and varied research efforts. Read about our scholarly, educational, and outreach accomplishments from publishing in peer-reviewed journals, to winning prestigious national awards and grants, to invited speaking engagements at national and international conferences.

We are always trying to find new and innovative ways to honor the achievements and increase the visibility of female athletes. Just last month we hosted the inaugural Tucker Center Film Festival in which we featured a sneak preview of *The Mighty Macs*, a soon-to-be released film about the women's basketball team at Immaculata College in Pennsylvania and their pioneering and inspirational head coach, Cathy Rush. Read more about our Film Festival on page 3. Finally, next November, the Tucker Center is hosting the 2011 Girls & Women in Sport Conference. This one-day event precedes the annual meeting of the North American Society for the Sociology of Sport (NASSS).

Our newsletter is rapidly becoming too small to capture all the work we are doing, so be sure to check out our Web site or follow us on Facebook for the latest and most up-to-date information on all we do to make a difference in the lives of girls and women.

—Mary Jo Kane, Director



Mary Jo Kane



injuries are concussions. They are generally most frequent in contact and collision sports, among younger athletes, and take place during competitions versus practice. On average, females have lower total incidences of sport-related concussion than males due to factors such as frequency of sport participation in general, lower physical activity levels, and much less participation in collision sports. But it should also be noted that females have higher rates (injuries expressed per unit of participation time) of concussion injury than males in several comparable sports. For example, data for high school and college athletes show higher rates of concussion for females than males in ice hockey, soccer, and basketball, as well as gender-similar rates in base/softball, volleyball, and lacrosse. The highest concussion rates for female athletes in high school and college occur in ice hockey, soccer, and basketball.

Level of competition matters too—concussions occur at a higher rate for females in intercollegiate versus high school sports. Cultural, social, and psychological risk factors for concussion injury and response among female athletes include sport norms (expectations to be “tough” and play through pain and injury), rules of play (greater concussion risk in ice hockey checking leagues), lack of sportsmanship (illegal play increases the risk for concussion injuries), and reporting rates (though female athletes are more likely to report injuries than males, many athletes of both genders fail to report concussion at all).

The Role of Sex Differences and Sex Hormones on Concussions:

Dr. Jill Brooks, Clinical Neuropsychologist, Head to Head Consultants, Gladstone, NJ. An overview of research on sex differences and how it applies to traumatic brain injury is confusing and equivocal. Hormonal effects have been studied in the womb. Physical changes at puberty have been associated with differences in behavior, cognition, and mood in early adolescence. Scholars have suggested that sex differences are linked to the brain's responsiveness to sex hormones throughout the lifespan. There is evidence to suggest that male and female nervous systems respond differently to injury caused by stroke or trauma. Conflicting findings also exist as to whether girls

and women suffer less brain damage following a blow to the head when compared to their male counterparts. A loss of circulating female sex hormones eliminates neuroprotection (prevention of degeneration of neurons within the brain and central nervous system [CNS]) at a cellular level. In animal models, sex differences exist in that females consistently exhibit less cellular damage following CNS insult. Finally, female hormones such as estrogen and progesterone also appear to protect rodents from brain damage following head injury. These disparate findings and lines of inquiry have led scholars to ask: What does all this research mean for female athletes?

One answer to that critical question is that gender and sex differences (and similarities) are an important fundamental variable in human research. Another answer is that efficacy of potential treatments for central nervous system injury (i.e., concussion) may differ by sex. Gender and sex differences exist on the biological, social, educational, and cultural levels, but are not always clearly or completely teased apart. Hormone levels during the lifespan influence cognitive, emotional, and physical attributes as well as neuroprotection, response to injury, and potential outcome. Incidence and severity of traumatic brain injury appear different for males and females, yet the examination of neuropsychological outcomes following concussion is in its infancy and most of the research has focused on male athletes. Neuroprotection and hormonal influences hold promise for both prevention and treatment in the areas of concussion and more severe brain injury. Finally, and perhaps most importantly, the study of concussion in men and boys should not be a model against which girls and women are measured.

Education of Parents, Coaches, Athletes and Fans about Prevention of Concussions:

Dr. Aynsley M. Smith, Research Director, Mayo Clinic Sports Medicine Center. The decision to focus on the female athlete and concussion is timely and important for several reasons. In contact sports such as ice hockey, participation has greatly expanded over the last two decades. Though the body of evidence is limited, the few research studies that have been conducted suggest females have a

higher prevalence and some data suggest concussed females take longer to recover than do males. In addition, prevention strategies currently receiving emphasis, such as a movement to postpone body checking in hockey until Bantams (age 13), fails to impact specifically on girls' hockey because the no-checking rule for their sport already exists.

Research that explores gender differences in hockey and soccer is beginning to accumulate, although admittedly it is still in its infancy, while research on other sports is nearly non-existent. Gender differences related to concussion occurrence seem to be linked to factors such as greater head impact accelerations (movement in response to a blow/impact); head-neck anthropometrics and isometric neck muscle strength; neck muscle mass; and possibly core strength on skates. In addition to these findings, some research indicates that anticipation, reaction time in terms of activation, likelihood to self-report, and the social acceptance of self-reporting may also impact the prevalence of concussion in female athletes. Finally, in the sport of soccer there is decreased effectiveness of head gear to reduce acceleration in females compared to males—the acceleration actually increases when head gear is used by sportswomen. To provide meaningful education about concussion in female athletes, additional research is greatly needed. It may be particularly helpful to consider gender specific content, motivation, and learning preferences so the material will be well received and thus result in a modification of concussion-prone behavior among female athletes.

A Female Athlete's Perspective on Concussions:

Kelli Blankenship, Kinesiology Undergraduate, Tucker Center McNair Scholar, and Gopher Women's Hockey Team Alumnae. For the 18 years I played competitive hockey, I was unaware of the seriousness of head injuries until I attended college. The first time I had any sort of noticeable head trauma was during a 14 and under boys' game. I took a check head-on and blacked out. I continued to play because it was not until a few months later that I realized I might have experienced a concussion.

I had three more concussions during my sophomore year of high

school. One was so severe that I underwent brain scans and was hospitalized. In spite of this, the constant pressure from my coaches and teammates to skate made it difficult for me to properly recover. I felt as though many people thought I was faking my injury and just did not want to compete. Unlike a broken bone, people cannot as easily witness the physical implications of a concussion, let alone the cognitive and emotional repercussions. Due to external pressures and my lack of awareness, I returned to the ice too early and consequently still continue to experience side effects such as headaches, fatigue, light-headedness, buzzing sounds, light sensitivity, and stars (white and sometimes blue circles).

It was not until I went to college that I finally realized the importance of rest and down time athletes need in order to recuperate and recover from a head injury. I was taught the importance of concussion awareness when each player had to take an impact test at the beginning of my freshman year at the U of M. This test alone taught me the significance of head trauma on the basis of reaction time, memory, and coordination. I suffered two mild concussions during my senior year. The team doctor

recommended that I get as much rest as possible and avoid any stress and physical activity until all signs dissipated.

I have spoken with other college athletes who have expressed their frustrations because of the amount of time it takes for concussions take to heal. I believe that those who are aware will take the necessary time they need away from their sport in order to reduce the risk of more permanent brain damage. Concussion education and awareness should be targeted at the high-school level. By focusing on this age group, we can also educate parents and coaches about the risks and proper preventative measures for sport-related concussions.

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To read the full text versions from our contributing authors read the online version of our newsletter at www.tuckercenter.org. To hear more about concussions, the latest research, prevention, and educational strategies pertaining to female athletes, be sure to attend our Distinguished Lecture or tune into our Web LiveStream on Thursday, April 14, 7-9pm CST.

SAVE THE DATE!

2011 Girls & Women in Sport Conference

The Tucker Center is hosting the **2011 Girls & Women in Sports Conference** to be held in Minneapolis during the first week of next November. This exciting one-day event precedes the annual meeting of the North American Society for the Sociology of Sport and bring together scholars, practitioners, and advocates dedicated to making a difference in the lives of females in and through involvement in sport and physical activity. More information—as well as a call for papers—is available on the “Events” tab on our Web site at www.tuckercenter.org.

KEEP IN TOUCH WITH THE TUCKER CENTER!

There are several ways you can keep up to date with the most recent events and news from the Tucker Center. For starters, the Tucker Center's Web site is our online hub. Everything from current research to staff contacts can be found at:

www.tuckercenter.org

The Tucker Center also maintains a presence on Wordpress, Facebook, Twitter, YouTube, and via RSS:

- **Wordpress Blog:** tuckercenter.wordpress.org
- **Facebook:** z.umn.edu/tcfacebook
- **Twitter:** www.twitter.com/tuckercenter
- **YouTube:** www.youtube.com/tuckercenter
- **RSS Feed:** z.umn.edu/TCRSS

We hope you'll take advantage of all the ways we are sharing information!



Inaugural Tucker Center Film Festival Sells Out!

In celebration of the 25th anniversary of National Girls and Women in Sports Day—and to honor and increase the visibility of female athletes—we recently hosted the first-ever Tucker Center Film Festival (TCFF). The sold-out event, featuring a sneak preview of Sony's *The Mighty Macs*, was co-sponsored by the University of Minnesota's Athletic Department as well as the Minnesota Lynx. Set against the backdrop of the feminist movement and the passage of Title IX in 1972, *The Mighty Macs* tells the inspiring true story of Immaculata (PA) College's women's basketball team, the efforts of their pioneering head coach Cathy Rush, and their amazing road to winning the first national championship in women's college basketball.

Julie Lundquist, a coach for the Prior Lake Soccer Club who brought her girls' soccer team to the event stated, "I don't think our girls realized how far women's sports have come in such a short amount of time. We will continue to have discussions regarding Title IX. The girls cannot even imagine not being allowed to play sports!" *The Mighty Macs* will open nationwide April 1st in conjunction with the Women's Final Four. Check your local listings because you don't want to miss this amazing film! And if you have a video or film you'd like to submit for next year's event, contact Nicole LaVoi for more information [nmlavoi@umn.edu].



STAFF UPDATES: JULIA DUTOVE

Julia Dutove joined the Tucker Center in September, 2010, as a doctoral student in Kinesiology and Research Assistant under the guidance of Dr. Nicole LaVoi. A native of Canada, Dutove completed her B.A. degree in Physical Education at the University of Alberta (U of A) in Edmonton, Alberta in 2007. She continued her educational pursuits by entering the Master's program at U of A, which she completed this past year. During her tenure at the U of A, Dutove was awarded the Queen Elizabeth II Master's Scholarship. It should be noted that this is the highest level of scholarship available for students enrolled in their Master's program.

Dutove's thesis—*A Constructivist Approach to Understanding a Coach's Learning Through Mentoring*—examined the various ways learning occurs during a mentoring program targeted to youth swim coaches. Her most recent research interests include coach education and coach learning, and how these factors influence female coaches in particular. She is currently working with Dr. LaVoi to develop a comprehensive model of coaching barriers and supports for female coaches.

In addition to her graduate studies, Dutove enjoys coaching young swimmers. She has worked



with young athletes for over a decade and is a member of the National Coaching Certification Program of Canada as a swim coach. She also enjoys yoga, warm-weather outdoor activities, and watching the Vancouver Canucks win! What has it meant for her to come to the U of M and pursue her Ph.D. in the Tucker Center? Dutove says, "Working at the Tucker Center has been a great way to connect with students and scholars interested in sport for girls and women. I am looking forward to the opportunities I will have in the future through these critical connections." Dutove's positive energy, can-do attitude, and ability to synthesize diverse bodies of literature make her a great addition to the Tucker Center. And as an added bonus, her love of hockey makes her fit right in!

KUDOS & ANNOUNCEMENTS

Honors & Awards

- Dr. **Jennifer Bhalla** and TC Co-Director and Professor **Maureen Weiss** won the Research Writing Award from the AAHPERD Research Consortium for their paper, "A cross-cultural perspective of parental influence on achievement beliefs and behaviors in sport and school domains." This award identifies outstanding contributions of scholarship from papers published in *Research Quarterly for Exercise and Sport*.
- TC Affiliated Scholar Professor **Daheia Barr-Anderson** has received a prestigious NIH federal grant. The Building Interdisciplinary Research Careers in Women's Health (BIRCWH) award is entitled, "The effectiveness of a culturally tailored physical activity, healthy eating, and environmental intervention for African American girls."
- **Weiss**, along with Professors **Toben Nelson** and **Mary Hearst** from the School of Public Health, received funding from the U of M's *Grants in Health Disparities Research* to conduct evaluation research of a physical activity-based youth development program in North Minneapolis. The purpose of the project is to reduce obesity and promote healthy lifestyles among adolescent youth populations.
- Doctoral student **Emily Houghton** was elected to a two-year term as a graduate student representative for the North American Society for the Sociology of Sport (NASSS).
- Doctoral candidate **Chelsey Thul** received a Thesis Research Grant from the U of M's Graduate School to support her research on overcoming barriers to physical activity for East African adolescent girls.

Scholarly Activities

- TC Director and Professor **Mary Jo Kane**'s manuscript, "Fictional denials of female empowerment: A feminist analysis of young adult sports fiction" has been reprinted in V. Bjerre and S. Bandy (Eds.), *Literary tales of sport in Scandinavia: Heroes, memories and identity* (Copenhagen: Aarhus University Press, 2010). **Kane** has also been invited to write an article on the sexualization of female athletes for a special edition of *The Nation* magazine.
- TC Associate Director Dr. **Nicole M. LaVoi**, along with Fulbright Senior Scholar **Sarah Leberman**, Massey University, New Zealand, have published "Juggling balls and roles, mother-coaches in youth sport: Beyond the dualistic mother-worker identity" in the *Journal of Sport Management*.

- **Weiss** and former doctoral student Dr. **Melissa Price**, University of Nevada, published a study titled, "Peer leadership in sport: Relationships among personal characteristics, leader behaviors, and team outcomes" in the *Journal of Applied Sport Psychology*.
- **Thul**, along with adviser **LaVoi**, published "Reducing physical inactivity and promoting active living: From the voices of East African adolescent girls" in the *Qualitative Journal of Sport & Exercise*.

Presentations

- TC Affiliated Scholar Professor **Diane Wiese-Bjornstal**, along with graduate students **Ayanna Franklin**, **Tara Robertson**, **Monique Foster**, and **James Winges**, presented a symposium last October entitled, "Sport injury psychology and socioculture: Does gender matter?" at the Association for Applied Sport Psychology Annual Conference in Providence, RI.
- **Austin Stair Calhoun** and **Alyssa Norris**, Sport Psychology Doctoral and Master's students, respectively, conducted a workshop pertaining to their ongoing research projects exploring gay coaches' experiences within intercollegiate athletics at the Creating Change Conference in Minneapolis last February.
- **Weiss** gave an invited presentation titled, "Teach the children well: A holistic approach to developing physical, social, and psychological competencies through physical education" at the Annual Meeting of the National Academy of Kinesiology in Williamsburg, VA, last October.
- **Wiese-Bjornstal** presented a talk on "The science of aggression and reinforcement in ice hockey: Implications for concussion risk and consequence" at the Mayo Clinic Ice Hockey Summit: Action on Concussion in Rochester, MN, last October.
- **LaVoi**, **Calhoun**, and Professor **Marie Hardin**, Curly Center for Sport Journalism, Pennsylvania State University, participated in a symposium titled, "Getting sport sociologists 'off the bench': The many uses of blogs" at the NASSS Annual Meeting in San Diego, CA, last November.
- Master's student **Katie Wurst** organized a national-level coach education workshop co-hosted by the Tucker Center and USA Rugby, which was held at the U of M in March. Rugby is played in 120+ countries, currently classified as an NCAA emerging sport for women, and is a newly inducted Olympic sport.

SPRING 2011 DISTINGUISHED LECTURE

THE FEMALE ATHLETE AND CONCUSSIONS

a panel featuring

Jill Brooks, Diane Wiese-Bjornstal & Aynsley Smith

Thursday, April 14, 2011, 7-9 pm

Cowles Auditorium, Hubert H. Humphrey Center, West Bank



Jill Brooks



Diane Wiese-Bjornstal



Aynsley Smith

About the Distinguished Lecture

Recent research findings in multiple academic disciplines have sparked a much-needed national conversation about the rising incidence, severity, and consequences of sport-related concussions. This conversation has also raised our awareness, increased our educational efforts, and spurred policy changes. Unfortunately, the vast majority of concussion-related research and public dialogue have centered on male athletes, specifically at the professional level. Yet concussions—and their devastating consequences—affect athletes in all sports and at all levels, regardless of gender. This has prompted scholars to ask: Do gender differences exist in sport-related concussion risk, symptoms, outcomes, and recovery? To address these critical questions and issues, nationally recognized experts will discuss the latest research about what is known and not known regarding the impact of concussions on female athletes. Strategies for future research, as well as educational and prevention efforts, will also be examined.

About the Panelists

Jill Brooks, Ph.D., is a clinical neuropsychologist who maintains a private practice in New Jersey and serves on the Medical Advisory Board for the New Jersey State Interscholastic Athletic Association. Dr. Brooks has published numerous articles and book chapters in the areas of neurogenic speech and language disorders, executive dysfunction and concussion in sports. She helped create the guidelines for management of concussion in New Jersey high schools, and was instrumental in the creation of the New Jersey State Law for management of concussion in sports, considered the most comprehensive concussion law in the United States. Dr. Brooks' research on concussions in female student-athletes has been featured in numerous national media outlets including *ESPN The Magazine* and *ESPN Outside the Lines*. Dr. Brooks has served as a consultant at the high school, college, and professional sports levels to aid coaches and athletic administrators on the dangers of sport-related concussions.

Diane Wiese-Bjornstal, Ph.D., is an Associate Professor of Sport & Exercise Psychology in the School of Kinesiology at the University of Minnesota. Professor Wiese-Bjornstal is a Fellow of the Association for Applied Sport Psychology (AASP), and of the Research Consortium of the American Alliance of Health, Physical Education, Recreation, and Dance (AAHPERD). She is currently serving a three-year term for the Sport Science Advisory Board of the President's Council on Physical Fitness and Sport. Her scholarship and expertise focus on two areas of research: the health and development of competitive youth sport participants, and the psychological responses of athletes to sport injury. Professor Wiese-Bjornstal serves as the co-editor of *Counseling in Sports Medicine*, and has authored numerous articles in top-tier academic journals.

Aynsley Smith, Ph.D., R.N., is an Associate Professor in Orthopedic Surgery and Physical Medicine and Rehabilitation at the Mayo Clinic College of Medicine. She is also the Research Director at the Mayo Clinic Sports Medicine Center and an AASP Certified Consultant. In 2010, Dr. Smith organized and co-directed the first-ever Ice Hockey Summit: Action on Concussions, and coordinated the writing of the seminal document, "Zero Tolerance of Concussions and other Neurotrauma in Ice Hockey: Rationale for Collaborative Action." In 2003, Dr. Smith received the Hughston Award from the American Orthopedic Society for Sports Medicine for a paper entitled, "Head and Facial Protection in Hockey." A widely published scholar, Dr. Smith co-chairs the Minnesota Hockey Education Program and has been instrumental in implementing the Fair Play Program which has resulted in less violence and injuries in youth hockey.

Watch the Spring 2011 Distinguished Lecture live:
www.tuckercenter.org/lecture/live_stream.htm

Visit our multimedia archive of past Distinguished Lectures with streaming video, PowerPoint presentations, and other informative resources:
www.tuckercenter.org/lecture/media_library.htm

DID YOU KNOW?

The Sad-but-True Facts about Concussions

According to the Centers for Disease Control and Prevention (CDC), a concussion is a traumatic brain injury. Concussions are especially prevalent in organized, competitive sports where more than 1.6 million concussions occur each year in the United States alone. Why are sports such a breeding ground for concussions? Because a concussion is a brain injury caused by direct or transferred impact forces to the head following intentional or unintentional collisions. The consequences of such collisions can be dramatic and dangerous—athletes frequently report both physical and cognitive symptoms such as severe and prolonged headaches, confusion, nausea, dizziness, sensitivity to light and noise, inability to think and concentrate, and short- and long-term memory loss.

Most concussions do not involve a loss of consciousness, which mistakenly results in premature return to play or not seeking medical treatment. For children and youth whose brains are still developing, appropriate treatment of concussion is even more important. Recognition and proper response to concussions when they first occur can help prevent further injury or even death in the most extreme cases. It is important to note that even when an athlete feels symptom-free, his or her brain may still be healing and recovering. The bottom line is that allowing an athlete to get back on the field should always be the decision of a health care professional.

All stakeholders in sports need to learn the signs and symptoms of a concussion, as well as what to do if one occurs. The CDC *Heads Up: Concussion in Sports* program and resources provide parents, coaches, and players with easy online access to excellent educational materials about concussion signs, symptoms, and care. To learn more, go to www.cdc.gov/concussion/sports.



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