Researchers identify head impact rates in four major high school sports

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As high school athletes return to practice and games for a variety of sports, the threat of concussions remains. A new study from researchers at Children's Hospital of Philadelphia (CHOP) used head impact sensors in four different sports and studied male and female athletes to determine which of these sports put students at the highest risk for head impacts that could lead to concussions. The findings were published online by the *Orthopaedic Journal of Sports Medicine.*

"Adolescents are particularly vulnerable to concussion because they frequently participate in sporting and recreational activities and have slower recovery periods compared to adults," said Kristy Arbogast, Ph.D., senior author and co-lead of the Minds Matter Concussion Program at CHOP. "Providing reliable data on head impact exposure and sport-specific mechanisms may help sports organizations identify strategies to reduce impact exposure and lower the risk of acute injury."

Building upon previous research that determined how to derive accurate data from headband-mounted head impact sensors through video confirmation, CHOP researchers sought to quantify sport and gender differences in head impact rates and mechanisms in male and female high school soccer, basketball, lacrosse, and female field hockey.

This is the first study to provide head impact analysis for basketball and field hockey and is one of the largest studies of its kind because of its inclusion of multiple sports and both genders. Data was collected from 124 athletes (56 girls, 68 boys) over the course of 104 games and more than 1,600 head impacts across the four sports.

Soccer had the highest head impact rate for both boys and girls across the sports that were analyzed. This was attributed to the role of intentional headers, which accounted for 80% of the head impacts in that sport. High school male sports consistently had higher head impact rates than female sports in soccer, basketball, and lacrosse.

Basketball had a higher head impact rate than lacrosse and field hockey for females and a similar impact rate to lacrosse for males. The similarity in impact rate between male basketball and lacrosse was unexpected considering male lacrosse is classified as a collision sport permitting intentional checking and body contact and requires the use of a helmet.

Impact mechanisms varied by sport, creating sport-specific targets for prevention efforts aimed at reducing head impact exposure. For example, lacrosse had a higher proportion of equipment-to-head impacts than the other sports due to the role of the stick in lacrosse. However, most of the head impacts in basketball were due to player-to-player contact. These findings point to potential sport- and gender-specific rule and equipment strategies to minimize head impact exposure.

"It's important to recognize that all head impacts

are not created equal, so future studies need to explore the magnitude of these impacts," Arbogast said. "For example, lacrosse and basketball may have similar impact rates, but the severity of impacts in lacrosse may be higher."

More information: Colin M. Huber et al, Sport- and Gender-Based Differences in Head Impact Exposure and Mechanism in High School Sports, *Orthopaedic Journal of Sports Medicine* (2021). DOI: 10.1177/2325967120984423

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