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Title: The Effect of Sport Specialization on Lower Extremity Injury Rates in High School Athletes

Authors:

Timothy A. McGuine, PhD, David Bell, PhD, Margaret Alison Brooks, MD, Scott Hetzel, MS, Adam Pfaller, BS, Eric Post.

University of Wisconsin, Madison, WI, USA.

Objectives: Sport specialization has been shown to be associated with increased risk of musculoskeletal lower extremity injuries (LEI) in adolescent athletes presenting in clinical settings. However, the association of sport specialization and incidence of LEI has not been studied prospectively in a large population of adolescent athletes. The objective of this study was to compare the incidence of LEI in high school athletes identified as having low (LOW), moderate (MOD) or high (HIGH) levels of sport specialization.

Methods: Subjects (male and female, interscholastic athletes, grades 9 - 12) were recruited from a diverse sample of 29 Wisconsin high schools during the 2015/16 school year to participate in the study. Subjects completed a questionnaire identifying all of the interscholastic and club sports they participated in during the previous and current school years, history of previous LEI, their primary sport and the number of primary sport competitions in which they participated in within the previous 12 months. Sport specialization status was determined using a previously published 3 item specialization scale (total score: 0 - 1 = LOW, 2 = MOD, 3 = HIGH). Athletic trainers at each school reported all athletic exposures and LEI that occurred for each subject during each interscholastic sport season they participated in during the school year. Analyses included group proportions, Odds Ratios (OR, [95%CI]) and median days lost due to injury (Med [IQR 25th,75th]). Multivariate Cox Proportional Hazards Ratios (HR, [95%CI]) were calculated to investigate the association between the incidence of LEI and sport specialization level while controlling for gender, grade, history of previous LEI, primary sport and the number of primary sport competitions.

Results: A total of N =1,544 subjects (Female = 50%, Age =16.1±1.1 yrs.) enrolled in the study, competed in 2,843 athletic seasons and participated in 167,349 athletic exposures during the school year. Subjects were classified as being LOW (60%), MOD (27%) or HIGH (13%) specialization. Females were more likely to be classified as HIGH than males (OR = 2.07 [1.53 - 2.81, p < 0.001]). The sports with the greatest percentage of HIGH participants were soccer (22%), baseball/softball (19%), volleyball (17%), and basketball (13%). Two hundred thirty five subjects (15%) sustained a total of n = 276 LEI that caused them to miss a median of 7.0 [2.0, 22.8] days. Injuries occurred most often to the ankle (34%), knee (25%), upper leg (13%) and lower leg (12%). LEI were acute (66%) or gradual / recurrent (34%) onset. Common injuries included ligament sprains (41%), muscle / tendon strains (25%) and tendonitis / tenosynovitis (20%). Surgical treatment was required for n = 23 (8%) of the LEI. The incidence of LEI for MOD subjects was higher than LOW subjects (HR = 1.51 [1.04 - 2.20], p = 0.029). The incidence of LEI for HIGH subjects was higher than LOW subjects (HR = 1.85 [1.12 - 3.06], p = 0.017).

Conclusion: Interscholastic athletes with MOD or HIGH sport specialization were more likely to sustain a LEI than athletes with LOW specialization. Sports medicine providers need to educate officials of sport

governing bodies, school coaches, parents and interscholastic athletes regarding the increased risk of LEI for athletes who specialize in a single sport.