

2015 Research Annual Report

Sports Medicine

RESEARCH AND TRAINING DETAILS



[Click to view members](#)

Faculty	7
Joint Appointment Faculty	1
Support Personnel	7
Direct Annual Grant Support	\$291,407
Direct Annual Industry Support	\$164,967
Peer Reviewed Publications	36

CLINICAL ACTIVITIES AND TRAINING

Clinical Fellows	2
Outpatient Encounters	4,013

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Research Highlights

Sports Medicine Human Performance Laboratory

The **Human Performance Laboratory** at Cincinnati Children's Sports Medicine Biodynamics Center was established in 2002 to provide a technology-driven laboratory to continually advance and validate cutting-edge injury prevention and

athletic development programs. Over the past 13 years, the researchers from Sports Medicine have produced some of the most progressive and clinically translatable data related to injury prevention in youth athletes.

In FY15, with funding from the [Cincinnati Children's Research Foundation](#), the Division of Sports Medicine and the Human Performance Laboratory ushered in a new era of technological advances with the creation and construction of a new state-of-the-art facility called the SPORT Center. This area boasts an upgraded motion capture system which allows for high fidelity measurement of inverse dynamics during sport maneuvers. Our experts in Sports Medicine, in collaboration with the [Center for Cognition, Action and Perception](#) and the [Center for Simulations and Virtual Environments Research](#) at the [University of Cincinnati](#), will be exploring the world of virtual reality to both identify risk factors for injury prevention and develop targeted biomechanical injury prevention techniques.

Significant Publications

Anderson JB, Grenier M, [Edwards NM](#), Madsen NL, Czosek RJ, Spar DS, Barnes A, Pratt J, King E, Knilans TK.

[Usefulness of combined history, physical examination, electrocardiogram, and limited echocardiogram in screening adolescent athletes for risk for sudden cardiac death.](#) *Am J Cardiol.* 2014 Dec;114(11):1763-7.

This study of 659 adolescent athletes was focused on evaluating a limited echocardiogram as an adjunct to history, physical exam, and electrocardiogram for identifying cardiac conditions that would increase the risk for sudden cardiac death. The authors found that physical examination alone was ineffective in identification of subjects at elevated risk for sudden cardiac death, but also that echocardiogram identified many conditions not associated with elevated risk for sudden cardiac death.

Hall R, Barber Foss K, Hewett TE, [Myer GD](#). [Sport specialization's association with an increased risk of developing anterior knee pain in adolescent female athletes.](#) *J Sport Rehabil.* 2015 Feb;24(1):31-5.

There is an emerging trend in young athletes specializing early in a single sport instead of participating across multiple sports over the year. This research highlights the negative consequences of adolescent athletes specializing in a single sport and shows that this early specialization results in an increased risk of knee injuries.

Murphy A, Kist C, Gier AJ, [Edwards NM](#), Gao Z, Siegel RM. [The feasibility of high-intensity interval exercise in obese adolescents.](#) *Clin Pediatr (Phila).* 2015 Jan;54(1):87-90.

This pilot feasibility study enrolled obese youth in order to test a new exercise protocol using high-intensity interval exercise. The four-week intervention had an attendance of 95%, with 100% of participants reporting they would recommend it to a friend, and 86% reporting a desire to "continue with the same type of exercise program". Fitness improved in both intervention and control groups. This study was the first to demonstrate that a practical and enjoyable high-intensity interval exercise protocol can be successfully performed by obese children in a weight management program.

[Wall EJ](#), Polousky JD, Shea KG, Carey JL, Ganley TJ, Grimm NL, Jacobs JC Jr, Edmonds EW, Anderson AF, Heyworth BE, Lyon R, Research on Osteochondritis Dissecans of the Knee (ROCK) Study Group. [Novel radiographic feature classification of knee osteochondritis dissecans: a multicenter reliability study.](#) *Am J Sports Med.* 2015 Feb;43(2):303-9.

The study represents an important collaboration between the divisions of Orthopaedics and Sports Medicine to develop and test a novel web based assessment of identified radiographic features of Osteochondritis Dissecans (OCD) femoral condyle lesions. The current investigation identified radiographic characteristics of the OCD that were reliable and that have potential for use in predictive model of time to healing and ultimate healing rates. Given the fact that time of healing and when they can return to sports are of the most common questions that parents and patients ask a sports medicine physician during their first clinic visit, this study lays the groundwork to better answer questions. In

addition, through use of novel web portal developed for this study, we are uniquely positioned to test and validate a radiographic prognostic model to predict and improve OCD lesion healing rates.

Division Publications

1. Anderson JB, Grenier M, Edwards NM, Madsen NL, Czosek RJ, Spar DS, Barnes A, Pratt J, King E, Knilans TK. **Usefulness of combined history, physical examination, electrocardiogram, and limited echocardiogram in screening adolescent athletes for risk for sudden cardiac death.** *Am J Cardiol.* 2014; 114:1763-7.
2. Bates NA, Myer GD, Hewett TE. **Prediction of kinematic and kinetic performance in a drop vertical jump with individual anthropometric factors in adolescent female athletes: implications for cadaveric investigations.** *Ann Biomed Eng.* 2015; 43:929-36.
3. Bates NA, Myer GD, Shearn JT, Hewett TE. **Anterior cruciate ligament biomechanics during robotic and mechanical simulations of physiologic and clinical motion tasks: a systematic review and meta-analysis.** *Clin Biomech (Bristol, Avon).* 2015; 30:1-13.
4. Benjaminse A, Gokeler A, Dowling AV, Faigenbaum A, Ford KR, Hewett TE, Onate JA, Otten B, Myer GD. **Optimization of the anterior cruciate ligament injury prevention paradigm: novel feedback techniques to enhance motor learning and reduce injury risk.** *J Orthop Sports Phys Ther.* 2015; 45:170-82.
5. Briskin S, Logan K. **Mental Health and Pressures in Teen Sports.** In: AC Hergenroeder, RA Demorest, eds. *AM:STARs: Sports Medicine and Sports Injuries, Vol. 26, No. 1.* Elk Grove: American Academy of Pediatrics; 2015:163-173.
6. Clagg S, Paterno MV, Hewett TE, Schmitt LC. **Performance on the modified star excursion balance test at the time of return to sport following anterior cruciate ligament reconstruction.** *J Orthop Sports Phys Ther.* 2015; 45:444-52.
7. Clark JF, Colosimo A, Ellis JK, Mangine R, Bixenmann B, Hasselfeld K, Graman P, Elgendy H, Myer G, Divine J. **Vision training methods for sports concussion mitigation and management.** *J Vis Exp.* 2015; .
8. DiCesare CA, Bates NA, Myer GD, Hewett TE. **The validity of 2-dimensional measurement of trunk angle during dynamic tasks.** *Int J Sports Phys Ther.* 2014; 9:420-7.
9. Eismann EA, Pettit RJ, Wall EJ, Myer GD. **Management strategies for osteochondritis dissecans of the knee in the skeletally immature athlete.** *J Orthop Sports Phys Ther.* 2014; 44:665-79.
10. Faigenbaum AD, Best TM, MacDonald J, Myer GD, Straccolini A. **Top 10 research questions related to exercise deficit disorder (EDD) in youth.** *Res Q Exerc Sport.* 2014; 85:297-307.
11. Ford KR, DiCesare CA, Myer GD, Hewett TE. **Real-time biofeedback to target risk of anterior cruciate ligament injury: a technical report for injury prevention and rehabilitation.** *J Sport Rehabil.* 2015; Technical Notes.
12. Gokeler A, Bisschop M, Myer GD, Benjaminse A, Dijkstra PU, van Keeken HG, van Raay JJ, Burgerhof JG, Otten E. **Immersive virtual reality improves movement patterns in patients after ACL reconstruction: implications for enhanced criteria-based return-to-sport rehabilitation.** *Knee Surg Sports Traumatol Arthrosc.* 2014; .
13. Hall R, Barber Foss K, Hewett TE, Myer GD. **Sport specialization's association with an increased risk of developing anterior knee pain in adolescent female athletes.** *J Sport Rehabil.* 2015; 24:31-5.

14. Kiefer AW, Kushner AM, Groene J, Williams C, Riley MA, Myer GD. **A Commentary on Real-Time Biofeedback to Augment Neuromuscular Training for ACL Injury Prevention in Adolescent Athletes.** *J Sports Sci Med.* 2015; 14:1-8.
15. Kushner AM, Kiefer AW, Lesnick S, Faigenbaum AD, Kashikar-Zuck S, Myer GD. **Training the Developing Brain Part II: Cognitive Considerations for Youth Instruction and Feedback.** *Curr Sports Med Rep.* 2015; 14:235-43.
16. Lloyd RS, Oliver JL, Faigenbaum AD, Howard R, De Ste Croix MB, Williams CA, Best TM, Alvar BA, Micheli LJ, Thomas DP, Hatfield DL, Cronin JB, Myer GD. **Long-term athletic development- part 1: a pathway for all youth.** *J Strength Cond Res.* 2015; 29:1439-50.
17. Lloyd RS, Oliver JL, Faigenbaum AD, Howard R, De Ste Croix MB, Williams CA, Best TM, Alvar BA, Micheli LJ, Thomas DP, Hatfield DL, Cronin JB, Myer GD. **Long-term athletic development, part 2: barriers to success and potential solutions.** *J Strength Cond Res.* 2015; 29:1451-64.
18. Logan K. **Overuse and underutilization in youth sports: time to seek equipoise.** *J Pediatr.* 2015; 166:517-9.
19. Maykut JN, Taylor-Haas JA, Paterno MV, DiCesare CA, Ford KR. **Concurrent validity and reliability of 2d kinematic analysis of frontal plane motion during running.** *Int J Sports Phys Ther.* 2015; 10:136-46.
20. Murphy A, Kist C, Gier AJ, Edwards NM, Gao Z, Siegel RM. **The feasibility of high-intensity interval exercise in obese adolescents.** *Clin Pediatr (Phila).* 2015; 54:87-90.
21. Myer GD, Bates NA, DiCesare CA, Barber Foss KD, Thomas SM, Wordeman SC, Sugimoto D, Roewer BD, Medina McKeon JM, Di Stasi SL, Noehren BW, McNally M, Ford KR, Kiefer AW, Hewett TE. **Reliability of 3-Dimensional Measures of Single-Leg Drop Landing Across 3 Institutions: Implications for Multicenter Research for Secondary ACL-Injury Prevention.** *J Sport Rehabil.* 2015; 24:198-209.
22. Myer GD, Kushner AM, Brent JL, Schoenfeld BJ, Hugentobler J, Lloyd RS, Vermeil A, Chu DA, Harbin J, McGill SM. **The back squat: A proposed assessment of functional deficits and technical factors that limit performance.** *Strength Cond J.* 2014; 36:4-27.
23. Myer GD, Smith D, Foss KD, DiCesare CA, Kiefer AW, Kushner AM, Thomas SM, Sucharew H, Khoury JC. **Response.** *J Orthop Sports Phys Ther.* 2014; 44:459-60.
24. Pappas E, Nightingale EJ, Simic M, Ford KR, Hewett TE, Myer GD. **Do exercises used in injury prevention programmes modify cutting task biomechanics? A systematic review with meta-analysis.** *Br J Sports Med.* 2015; 49:673-80.
25. Quatman-Yates C, Hugentobler J, Ammon R, Mwase N, Kurowski B, Myer GD. **The utility of the balance error scoring system for mild brain injury assessments in children and adolescents.** *Phys Sportsmed.* 2014; 42:32-8.
26. Rhea CK, Kiefer AW, Wright WG, Raisbeck LD, Haran FJ. **Interpretation of postural control may change due to data processing techniques.** *Gait Posture.* 2015; 41:731-5.
27. Ruff J, Wang TL, Quatman-Yates CC, Phieffer LS, Quatman CE. **Commercially available gaming systems as clinical assessment tools to improve value in the orthopaedic setting: a systematic review.** *Injury.* 2015; 46:178-83.
28. Schmitt LC, Quatman CE, Paterno MV, Best TM, Flanigan DC. **Functional outcomes after surgical management of articular cartilage lesions in the knee: a systematic literature review to guide postoperative rehabilitation.** *J Orthop Sports Phys Ther.* 2014; 44:565-A10.

29. Sil S, Thomas S, DiCesare C, Strotman D, Ting TV, Myer G, Kashikar-Zuck S. **Preliminary evidence of altered biomechanics in adolescents with juvenile fibromyalgia.** *Arthritis Care Res (Hoboken)*. 2015; 67:102-11.
 30. Straccolini A, Stein CJ, Zurakowski D, Meehan WP, 3rd, Myer GD, Micheli LJ. **Anterior cruciate ligament injuries in pediatric athletes presenting to sports medicine clinic: a comparison of males and females through growth and development.** *Sports Health*. 2015; 7:130-6.
 31. Sugimoto D, Alentorn-Geli E, Mendiguchia J, Samuelsson K, Karlsson J, Myer GD. **Biomechanical and neuromuscular characteristics of male athletes: implications for the development of anterior cruciate ligament injury prevention programs.** *Sports Med*. 2015; 45:809-22.
 32. Sugimoto D, Myer GD, Foss KD, Hewett TE. **Specific exercise effects of preventive neuromuscular training intervention on anterior cruciate ligament injury risk reduction in young females: meta-analysis and subgroup analysis.** *Br J Sports Med*. 2015; 49:282-9.
 33. Sugimoto D, Myer GD, Micheli LJ, Hewett TE. **ABCs of Evidence-based Anterior Cruciate Ligament Injury Prevention Strategies in Female Athletes.** *Curr Phys Med Rehabil Rep*. 2015; 3:43-49.
 34. Taylor-Haas JA, Hugentobler JA, DiCesare CA, Hickey Lucas KC, Bates NA, Myer GD, Ford KR. **Reduced hip strength is associated with increased hip motion during running in young adult and adolescent male long-distance runners.** *Int J Sports Phys Ther*. 2014; 9:456-67.
 35. Wall EJ, Heyworth BE, Shea KG, Edmonds EW, Wright RW, Anderson AF, Eismann EA, Myer GD. **Trochlear groove osteochondritis dissecans of the knee patellofemoral joint.** *J Pediatr Orthop*. 2014; 34:625-30.
 36. Wall EJ, Polousky JD, Shea KG, Carey JL, Ganley TJ, Grimm NL, Jacobs JC, Jr., Edmonds EW, Eismann EA, Anderson AF, Heyworth BE, Lyon R, Research on OsteoChondritis Dissecans of the Knee Study G. **Novel radiographic feature classification of knee osteochondritis dissecans: a multicenter reliability study.** *Am J Sports Med*. 2015; 43:303-9.
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Faculty, Staff, and Trainees

Faculty Members

Kelsey Logan, MD, MPH, Associate Professor

Leadership Division Director

Research Interests Dr. Logan's research interests include concussion; female athlete issues; overuse injuries in sport.

Kate Berz, DO, Assistant Professor

Research Interests Dr. Berz's research interests are in injuries of the female athlete, nutrition, and osteopathic manipulative therapy.

Nicholas Edwards, MD, MPH, Assistant Professor

Research Interests Nicholas M. Edwards, MD, MPH is focused on the areas of physical activity promotion and cardiovascular disease prevention.

Paul Gubanich, MD, MPH, Associate Professor

Leadership Fellowship Director

Research Interests Dr. Gubanich's research interests are sports concussion; medical problems in athletes; injury prevention; performance enhancement; musculoskeletal ultrasound.

Adam Kiefer, PhD, Assistant Professor

Research Interests Dr. Kiefer's research interests include augmented/virtual reality; behavioral dynamics; biofeedback; dynamical disease; exercise science; individual/team coordination; nonlinear dynamics; quantitative methods; sports medicine.

Greg Myer, PhD, Associate Professor

Leadership Director of Research

Research Interests Dr. Myer's primary research interests are related to injury biomechanics, pediatric exercise science and exercise prevention strategies.

Catherine Quatman-Yates, PT, DPT, PhD, Assistant Professor

Research Interests Dr. Quatman-Yates is interested in optimizing post-concussion evaluation and rehabilitation processes for children and adolescents.

Gregory Walker, MD, Assistant Professor

Research Interests Dr. Walker's research focus is physical inactivity in youth and concussion prevention and treatment.

Timothy Hewett, PhD, Adjunct

Research Interests Dr. Hewett's research interests lie in neuromuscular; biomechanical and molecular adaptation of the muscular; boney and nervous systems to stresses such as growth, development and neuromuscular training.

Laura Schmitt, PhD, Adjunct

Research Interests Dr. Schmitt is interested in outcomes after ACL reconstruction; injury biomechanics

Joint Appointment Faculty Members

Mark Paterno, PhD,PT, MS, MBA, SCS, ATC, Associate Professor (Occupational Therapy and Physical Therapy)

Research Interests Clinical outcomes after lower extremity injury; rehabilitation intervention outcomes; outcome after ACL reconstruction

Trainees

- **James Hahn, MD**, PGY IV
- **Gregg Kottyan, MD**, PGY IV

Grants, Contracts, and Industry Agreements

Grant and Contract Awards

Annual Direct

Kiefer, A

Driving Performance of Teenage Patients with Concussion

Ohio Department of Public Safety

9/17/2014-6/30/2015

\$49,540

Myer, G

Multi-Faceted Approach Modeling ACL Injury Mechanisms

National Institutes of Health (The Ohio State University Research Foundation)

R01 AR056259	9/16/2013-8/31/2018	\$13,744
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Identification of Patellofemoral Pain Risk Factors Developed During Maturation

National Institutes of Health

R21 AR065068	2/13/2015-1/31/2017	\$132,000
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Paterno, M

Prospective Study of Bio-mechanics and Early Degeneration after ACL Reconstruction

National Institutes of Health (The Ohio State University Research Foundation)

R21 AR064923	6/23/2014-5/31/2016	\$96,123
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Current Year Direct	\$291,407
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Industry Contracts

Myer, G

EIMindA Ltd	\$70,704
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Q30 Labs, LLC	\$94,263
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Current Year Direct Receipts	\$164,967
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Total	\$456,374
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Football Helmets Do Not Necessarily Protect Against ‘Brain Slosh’



Gregory Myer, PhD, FACSM

PUBLISHED JANUARY 2014

Journal of Orthopaedic & Sports Physical Therapy

Can woodpeckers and big horn sheep help solve the troubling and often debilitating problem of football concussions? Does a city’s altitude affect the likelihood that its NFL team members will experience concussions? Are better-padded helmets or stricter NFL rules on helmet-to-helmet contact actually solving football’s concussion problems?

Yes, yes, and no, according to a study by Gregory Myer, PhD, FACSM, Director of Sports Medicine Research at Cincinnati Children’s. Myer led a team of scientists who analyzed 300 concussions sustained by 284 professional football players during the 2012 and 2013 NFL seasons. Their findings, published in the *Journal of Orthopaedic & Sports Physical Therapy*, include:

- “Brain slosh,” the rapid acceleration and deceleration of the brain inside the skull, is the suspected common cause of concussions - not direct impact to the head.
- Big horn sheep and woodpeckers, which routinely experience tremendous blows to the head at 10 and 20 times that, respectively, of a head-to-head tackle, appear to be protected from brain injury via modulations of their intracranial blood volume that help make a tighter fit inside their skulls prior to impact. This finding could influence concussion prevention strategies that will better protect human athletes’ brains.
- Players in cities at the highest altitudes — Phoenix, Atlanta, Buffalo, Charlotte, Denver, Indianapolis, Kansas City, Minneapolis and Pittsburgh — have a combined 30 percent lower odds of sustaining a concussion relative to players in the NFL’s other 23 cities at 644 feet at sea level or lower. At higher altitudes, cerebral blood flow increases, which the research team hypothesized, might influence the brain to fit tighter inside the skull — like a bubble wrapping the brain.

“If we’re going to solve this problem, we have to figure out how to protect the brain from the inside out,” Myer says. “That’s why we think we might be on the leading edge of something that could influence a paradigm shift in concussion-prevention strategies.”

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Myer GD, Smith D, Barber Foss KD, Dicesare CA, Kiefer AW, Kushner AM, Thomas SM, Sucharew H, Khoury JC. Rates of concussion are lower in National Football League games played at higher altitudes. *J Orthop Sports Phys Ther.* 2014;44(3):164-72.

HELMET TO HELMET



HELMET TO FIELD



BLOW TO HELMET



body to helmet



arm to helmet



helmet to facemask

A team of scientists led by Cincinnati Children's analyzed 300 concussions sustained by 284 professional football players during the 2012 and 2013 NFL seasons. Among their findings: Games played in cities with higher altitudes had lower concussion rates, suggesting that topographical mechanisms that increase cerebral blood flow and volume may be useful for protecting the brain from injury during impact sports.

“If we’re going to solve this problem, we have to figure out how to protect the brain from the inside out.”