Sports Medicine

Division Photo

T. Hewett, M. Paterno, M. Shaffer, J. Divine

Division Data Summary

Research and Training Details

Number of Faculty	2
Number of Joint Appointment Faculty	2
Number of Research Fellows	1
Number of Research Students	7
Number of Support Personnel	8
Direct Annual Grant Support	$610,733
Peer Reviewed Publications	12

Clinical Activities and Training

Number of Clinical Fellows	1
Number of Other Students	6
Outpatient Encounters	3,470

Faculty Members

Jon Divine, MD, Associate Professor Clinical ; *Division Chief; Medical Director*

Timothy Hewett, PhD, Associate Professor ; *Center Director; Research Director*
Research Interests: Prevention of knee injuries in the female athlete

Joint Appointment Faculty Members

Mark Paterno, PT, MS, MBA, SCS, ATC, Field Service Assistant Professor
Occupational Therapy and Physical Therapy

Eric Wall, MD, Associate Professor Clinical
Orthopaedic Physicians and Staff

Trainees

- **Arlene Goodman, MD,** PGY-VI,
- **Adrick Harrison, PhD Candidate,**
- **Kevin Ford, PhD Candidate,**
- **Greg Myer, PhD Candidate,**
- **Mark Paterno, PhD Candidate,**
- **Carmen Quatman, MD,PhD Candidate,**
- **Taylor Aronhalt, MS Candidate,**
- **Sam Wordeman, PhD Candidate,**

Significant Accomplishments in FY08

Received a Priority Score of 106 on Dr. Tim Hewett's R01 Grant Submission titled "Neuromuscular Intervention Targeted to Mechanisms of ACL Load in Female Athletes".

The long-term goals of this grant are to determine the mechanisms by which female athletes become more susceptible to ACL injury and to develop interventions that address these mechanisms in order to reduce knee loads and ACL injury risk. The major goal of this proposal is to determine if decreased neuromuscular control of the trunk increases coronal plane knee load in high-risk groups of females. The rationale for this project is that its successful completion will provide a strong, evidence-based intervention that will effectively decrease ACL injury risk in high-risk female athletes.

Began studies looking at long-term outcomes and risk of second injury in ACL reconstructed patients.

The information gained from these studies represents and important next step in the construction of safe and appropriate rehabilitation guidelines for return to sport. The Aims of these studies will identify predictors of subsequent ACL injury following ACL reconstruction and will serve as a vital first step to improve the current rehabilitation programs following construction and ultimately aid in establishing appropriate guidelines that would allow athletes to return to their optimal level of play with minimal risk of future joint injury.

Conducted pre-season football combine testing to isolate neuromuscular deficits predictive of ACL injury and reinjury risk. This project was funded by National Football League Charities.

The pre-season football combine approach outlined in this proposal may improve the guidelines currently used to determine return to sport status for athletes following ACL reconstruction. Guidelines driven from functional status instead of temporal milestones may improve the potential for young football players to continue their careers with optimal performance and minimal risk of re-injury.

Significant Publications in FY08

Ford KR, van den Bogert AJ, Myer GD, Shapiro S and Hewett TE. The effects of age and skill level on knee musculature co-contraction during functional activities: A systematic review. Br J Sports Med 2008 Jul; 42(7): 561-6.

This study was one of the first published in the literature to demonstrate neuromuscular differences between male and female athletes across age groups and during growth and development. This work was the basis for the R03 application we are now submitting.

Renstrom P, Ljungqvist A, Arendt E, Beynnon B, Fukubayashi T, Garrett W, Georgoulis T, Hewett TE, Johnson R, Krosshaug T, Mandelbaum B, Micheli L, Myklebust G, Roos E, Roos H, Schamasch P, Shultz S, Werner S, Wojtys E, Engebretsen L. Non-Contact ACL injuries in female athletes: an International Olympic Committee current concepts statement. Br J Sports Med. 2008 June; 42(6):394-412.

This invited review for the British Journal of Sports Medicine discussed the current state of knowledge regarding the gender disparity in ACL injury incidence. The IOC 'position statement' means that it is the official "position" or "opinion" of the International Olympic Committee and is sanctioned by the IOC as such.

Zazulak BT, Hewett TE, Reeves NP, Goldberg B, Cholewicki J. The effects of core proprioception on knee injury: a prospective biomechanical-epidemiological study. Am J Sports Med. Mar;35(3):368-73 2007

Thisimportant paper in the American Journal of Sports Medicine, the premier journal in Sports Medicine, a collaboration with the Yale University Biomechanics Laboratory, detailed the first findings that female athletes with decreased trunk control are at increased risk of knee, ligament and ACL injury. It summarized a neuromuscular

training intervention that is novel among current interventions, as it is based on the trunk. These seminal findings were used as preliminary data for our newly funded $3 million R01 application, which will the effects of trunk training on knee injury risk in a Randomized Controlled Trial design.

Myer GD, Chu DA, Brent JL, Hewett TE. Trunk and hip control neuromuscular training for the prevention of knee joint injury. Clin Sports Med 2008 Jul;27(3): 425-48.

This article in Clinics in Sports Medicine, is an invited "Current Concepts" review for a premier review journal in Sports Medicine, detailed , detailed our latest neuromuscular training program for female athletes at increased risk of ACL injury. It summarized a neuromuscular training intervention that is novel among current interventions, as it is based on the trunk. It will be used for our newly funded $3 million R01 application, which will test it in a Randomized Controlled Trial. It also summarized the entire body of the literature regarding neuromuscular interventions that show the greatest promise for potential interventions.

Myer GD, Ford KR, Paterno MV, Nick T, Hewett TE. The Effects of Generalized Joint Laxity on Risk of Anterior Cruciate Ligament Injury in Young Female Athletes. Am J Sports Med. 2008 June; 36(6): 1073-80.

This article for American Journal of Sports Medicine, the journal with the highest impact factor in the field of Sports Medicine, detailed the initial longitudinal findings from our NIH-funded work "Identifying female athletes at high risk of ACL injury." This is the first of a series of articles that are resulting from data mining of our four plus years of longitudinal testing of athletes from an entire county school system.

Mentions in Consumer Media

- A joint solution: Prevention must begin at an early age The Statesville Record and Landmark , Newspaper
- Leveling the playing field AAOS Now , Magazine
- Knee injuries hit girls more often Florida Today , Newspaper
- With ACL tears, prevention is the key Hartford Courant , Newspaper

Division Publications

1. Archdeacon M, Ford KR, Wyrick J, Paterno MV, Hampton S, Ludwig MB, Hewett TE. A prospective functional outcome and motion analysis evaluation of the hip abductors after femur fracture and antegrade nailing. *J Orthop Trauma.* 2008; 22: 3-9.
2. Ford KR, Myer GD, Hewett TE. Reliability of landing 3D motion analysis: implications for longitudinal analyses. *Med Sci Sports Exerc.* 2007; 39: 2021-8.
3. Hewett TE. Predisposition to ACL injuries in female athletes versus male athletes. *Orthopedics.* 2008; 31: 26-8.
4. Krosshaug T, Nakamae A, Boden B, Engebretsen L, Smith G, Slauterbeck J, Hewett TE, Bahr R. Estimating 3D joint kinematics from video sequences of running and cutting maneuvers--assessing the accuracy of simple visual inspection. *Gait Posture.* 2007; 26: 378-85.
5. Myer GD, Ford KR, Brent JL, Divine JG, Hewett TE. Predictors of sprint start speed: the effects of resistive ground-based vs. inclined treadmill training. *J Strength Cond Res.* 2007; 21: 831-6.
6. Myer GD, Ford KR, Paterno MV, Nick TG, Hewett TE. The effects of generalized joint laxity on risk of anterior cruciate ligament injury in young female athletes. *Am J Sports Med.* 2008; 36: 1073-80.
7. Myer GD, Paterno MV, Ford KR, Hewett TE. Neuromuscular training techniques to target deficits before return to sport after anterior cruciate ligament reconstruction. *J Strength Cond Res.* 2008; 22: 987-1014.
8. Nakayama H, Chen X, Baines CP, Klevitsky R, Zhang X, Zhang H, Jaleel N, Chua BH, Hewett TE, Robbins J, Houser SR, Molkentin JD. Ca2+- and mitochondrial-dependent cardiomyocyte necrosis as a primary mediator of heart failure. *J Clin Invest.* 2007; 117: 2431-44.
9. Paterno MV, Ford KR, Myer GD, Heyl R, Hewett TE. Limb asymmetries in landing and jumping 2 years following anterior cruciate ligament reconstruction. *Clin J Sport Med.* 2007; 17: 258-62.
10. Quatman CE, Ford KR, Myer GD, Paterno MV, Hewett TE. The effects of gender and pubertal status on generalized joint laxity in young athletes. *J Sci Med Sport.* 2008; 11: 257-63.
11. Renstrom P, Ljungqvist A, Arendt E, Beynnon B, Fukubayashi T, Garrett W, Georgoulis T, Hewett TE, Johnson R, Krosshaug T, Mandelbaum B, Micheli L, Myklebust G, Roos E, Roos H, Schamasch P, Shultz S, Werner S, Wojtys E, Engebretsen L. Non-contact ACL injuries in female athletes: an International Olympic Committee current concepts statement. *Br J Sports Med.* 2008; 42: 394-412.
12. Smith R, Ford KR, Myer GD, Holleran A, Treadway E, Hewett TE. Biomechanical and performance differences between female soccer athletes in National Collegiate Athletic Association Divisions I and III. *J Athl Train.*

2007; 42: 470-6.

Grants, Contracts, and Industry Agreements

Grant and Contract Awards		Annual Direct / Project Period Direct
Hewett, T		
Cable and Gain in Persons with Stroke University of Cincinnati 0635006N	07/01/06 - 06/30/10	$12,000 / $45,000
Identifying Female Athletes at High Risk for ACL Injury National Institutes of Health R01 AR 049735	09/21/04 - 08/31/09	$367,041 / $1,878,539
Combine Testing to Isolate Neuromuscular Deficits Predictive of ACL Injury and Reinjury Risk NFL Charities	11/14/06 - 06/30/08	$77,982 / $77,982
Predicting ACL Injury in Female Athletes University of Cincinnati	07/01/07 - 06/30/08	$11,363 / $11,363
Schmitt-Haluszczak, L		
ACL Reconstruction and Athletes: Strength, Knee Mechanics and Outcome NFL Charities	07/01/07 - 06/30/08	$95,521 / $95,521
ACL Reconstruction in the Female Athlete National Institutes of Health F32 AR 055844	03/01/08 - 02/28/11	$46,826 / $147,750
	Current Year Direct	**$610,733**
	Total	**$610,733**