The Institute was created in 2005 at the University of Wisconsin—La Crosse in the Department of Health Professions, Physical Therapy Program. LIMS brings together scientists and clinicians from various disciplines seeking applied knowledge related to human movement, factors related to injury, and in the foundations of therapeutic exercise used in the treatment and rehabilitation of injury.

Each year over 40 students from graduate and undergraduate programs from the UW-L campus are involved in laboratory research including Physical Therapy, Physics, Exercise and Sport Science, and Biology. High-technology funding from the State of Wisconsin supports 8 Physics Biomedical student internships in the laboratory.

Due to the many publications from the clinical biomechanics laboratory, LIMS has developed a national/international reputation.

Dr. Almonroeder’s research with UWL ROTC

Military personnel routinely march while carrying 40+ pounds of equipment and supplies in a rucksack on their back (‘ruck marching’), which increases loading of the lower body joints. Not surprisingly, ruck marching appears to contribute to the high rates of lower body overuse injuries among military personnel. While the effects of load carriage on marching mechanics has been studied extensively, previous studies have typically compared loaded vs. completely unloaded marching. Our research team was interested in examining how more subtle changes in rucksack load influence marching mechanics. In collaboration with UW-L’s Army Reserve Officer Training Corps (ROTC) program, we examined the lower body mechanics of 18 cadets as they marched on an instrumented treadmill within our motion analysis lab. During marching, cadets carried relatively light (35 lbs), moderate (45 lbs), and heavy (55 lbs) loads in their rucksack. Interestingly, hip, knee, and ankle loading all decreased as rucksack load was reduced. Our findings indicate that even relatively subtle reductions in rucksack load lessen hip, knee, and ankle loading during marching. As result, it appears that efforts should be made to reduce rucksack loads, even slightly, in order minimize the risk of lower body injury among military personnel. Rucksack loads could potentially be reduced by limiting the need to carry non-essential equipment or by making equipment lighter. We shared our findings with the cadre and cadets in UW-L’s ROTC program and have prepared a manuscript for publication. In the future, we plan to examine ways to train cadets to prepare for the demands of ruck marching. In addition, we will investigate different potential approaches for limiting the effects of load carriage on lower body joint loading, such as reconfiguring rucksack load distribution or re-training cadets to march with different technique.

LIMS Scientists

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Drew Rutherford, MS, Laboratory Manager/Engineer (Health Professions),

Nate Vannatta, DPT, SCS, (Gundersen Sports Medicine),

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Kanikkai “Steni” Sakiriyas, PT, DSc, Clinical Biomechanics (Health Professions)
Gundersen/UWL Sports Medicine Residency Research

C.N. Vannatta, DPT, SCS

It has been an active year for Gundersen Sports Medicine residents despite changes due to the COVID pandemic implemented Spring 2020. Between physical therapy and family medicine residents, Gundersen clinicians and LIMS scientists have worked together that have resulted in presentations at local and national levels. Sports Medicine Resident Vien Vu, DPT presented a platform presentation at the 2020 APTA Combined Sections Meeting in Denver, CO investigating coincidence anticipation timing in athletes with and without ankle sprains. Family Medicine Resident Laura Jacobson, MD, has submitted a manuscript to The Knee describing sex differences in patellofemoral joint stress.

The 2019/20 Sports Physical Therapy residents have contributed to project investigating jump landing strategies in those recovering from ACL injury and also assisted in community programs for feedback training to help prevent ACL injury. With LIMS faculty and student efforts have submitted an abstract to the 2021 Combined Sections Meeting of the American Physical Therapy Association.

Gundersen’s Sports Physical Therapy residency continues to collaborate with LIMS in an ongoing prospective trial with the UW-L Men’s and Women’s Cross Country Teams. Preliminary data has allowed for two publications examining the sex differences in lower extremity muscle forces and relationships between hip strength, running kinematics, and muscle forces.

Published Manuscripts from Gundersen/LIMS Collaboration:


Abstracts/Presentations from Gundersen/LIMS Collaboration:

Vu V, Kovacs A, Wughalter E, Vannatta CN, Kernozek T. Effects of Ankle Sprains and Single versus Dual Task Paradigms on Coincidence Anticipation Performance in Female High School Basketball Players. Findings presented as a platform presentation at the 2020 APTA Combined Sections Meeting, Denver, CO.


Interested in being a participant or working with LIMS?

Contact Drew Rutherford, MS, drutherford@uwlaax.edu or Tom Kernozek, PhD tkernozek@uwlaax.edu for details.
ACL Injury Prevention Programming and Runner’s Clinic Partnership

Becky Heinert, MSPT, PT, SCS Gundersen Health

LIMS and Gundersen Health Sports Medicine: Community Partnership

Runners’ Clinic and LIMS PACER Lab

Approximately 70% of runners will experience some type of overuse lower extremity injury. LIMS and Gundersen Health Sports Medicine launched a pilot Runner’s Clinic to screen Winona high school cross country runners in the new PACER lab. Athletes received a custom report generated from the instrumented treadmill and 3D motion system along with a 2D qualitative assessment of their running biomechanics.

ACL Injury Prevention

Females are 2-8 times more likely to suffer an injury to the ACL with the vast majority resulting from a non-contact mechanism like an awkward landing. LIMS innovative portable force plate system has been used with over 270 high school and collegiate athletes to help identify and teach proper landing patterns that may reduce the risk of ACL injury. Last year UWL and LIMS partnered with Gundersen Health Sports Medicine to provide 4 weeks of force plate and video based feedback training to promote changes in landing performance over time. The results of our work may help to provide clinicians with recommendations for injury prevention training programs and insight as to how motor strategies are integrated into the pre-programmed motor patterns. Our recently accepted paper in the International Journal of Sports Physical Therapy shows that this type of training is quite effective in improving landing performance. Further work is ongoing. Grants from UWL and Gundersen Medical Foundation have supported for these initiatives.

Recently presented papers from community based collaboration:


Recently Published or In Press Research (2019-2020)


We measure movement performance!

Our laboratories have sophisticated equipment that measure motion, impact forces, pressures on the feet or in seating, muscle activation, energy cost and heart rate, or for the imaging of tendons or soft tissue.

These data can be used to determine the loading on joints and muscles to give insight to how and why injuries may occur or for the improvement of performance to keep you active.

Musculoskeletal models are used to determine loading on bone, joints, ligaments, and tendons.

Pressure distribution measures show us the pressure points in seating or on your foot during walking or running.

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University of Wisconsin
LA CROSSE

Check out LIMS on your smartphone!