



Athletic Assessment Services

Fall 2019

Background

The University of Michigan Performance Research Lab (MiPR) provides core research capabilities and educational laboratory opportunities in support of the multidisciplinary mission of the University of Michigan Exercise and Sports Science Initiative (ESSI):

To optimize human potential and advance well-being for people of all ages and abilities.

Athletic assessments, incorporating both injury and performance evaluation, are a major focus of the MiPR operation. Leveraging a unique partnership with Michigan Athletics, MiPR provides cutting edge services to coaches, trainers, and student-athletes with the goal of improving both individual and team performance for Michigan's 900 student-athletes and 29 teams. With a focus on athlete health and wellness as well as top-tier performance, MiPR assessments are primarily tailored to the needs of Michigan Athletics. The assessment framework is modelled on a synergistic partnership between ATC staff, sports medicine, coaches, and MiPR to ensure the highest value of service is provided. MiPR assessments serve as a foundation upon which sport-specific questions can be tailored and answered.

Assessment Overview

Assessment options can be split into two categories: Injury prevention and performance optimization. Injury prevention centers on identifying and analyzing underlying biomechanical or biometric issues that may contribute to an individual's injury risk. Injury reports will provide **clear** and **concise** summarization of findings that can be interpreted by ATC, strength & conditioning (S&C), and coaching staff. Injury etiology is a complex and multi-factored mechanism that is best tackled using a collaborative and multidisciplinary approach. A two-way channel will be established between UM Athletic medical staff and MiPR to discern individual athlete questions. Performance optimization focuses on analyzing metrics related to sport-specific movements with the goal of providing **actionable** data to the individual, trainers, and coaching staff. MiPR will help identify performance blockers and coordinate findings with coaching and S&C staff for team and individual level implementation.

- ⇒ Injury centered report providing quantitative & actionable data
- ⇒ Synergistic approach between ATC / UM Medical staff & MiPR
- ⇒ Primary outcomes focused on health & wellness + return-to-play
- ⇒ Improve data-driven decision making



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MiPR Capabilities

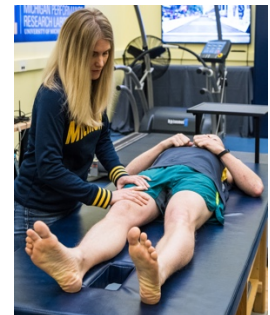
Instrumented Gait Analysis

- Body-worn sensors (IMUs) provide high-fidelity running gait dynamics (joint-angles, rotations, variability, etc.)
- Pressure sensitive treadmill records impact forces, foot strike characterization and underfoot pressure distribution.



Functional Clinical Assessment

- MiPR ATC evaluation of injury risks and performance blockers
- Detailed interpretation of Gait Analysis + HS Video
- Mobility + stability scoring protocols
- Comprehensive movement analysis utilizing MiPR equipment capabilities



VO2 Max Testing

- Endurance sports
- Maximum oxygen uptake reflects cardiorespiratory fitness and endurance capacity in exercise performance
- Track endurance changes over time



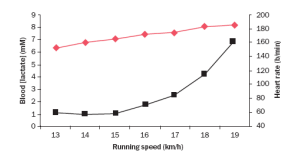
HR Zone Testing

- Multi-sport
- Provide individualized HR training zones for conditioning & coaching staff
- Design or improve sport-specific conditioning protocols



Blood Lactate Testing Protocol

- Establish sub-maximal training zones and provide athlete quantifiable training parameters
- Correlate intensity with velocity & HR zones





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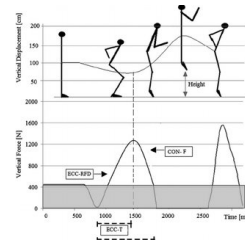
High-Speed Video

- Visual analysis → Injury + performance value
- sport-specific movement decomposition (i.e. throwing or sprinting)
- Qualitative information for expert review
- 2 cameras @ 1000 fps



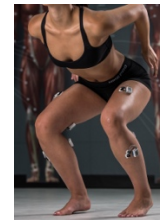
Force Plate Metrics

- Measure power production, rate of force generation, jump height, vertical/horizontal ground reaction forces, counter-movement metrics
- Bilateral asymmetries & weakness
- Validation of strength training programs with longitudinal tracking



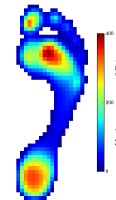
Surface EMG Measurement

- Identify pre-injury or post-injury asymmetries in muscle activation
- Provide insight into pathological muscle function
- More targeted rehab protocols to speed return-to-play



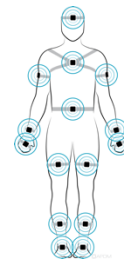
2D Foot Scan & Shoe Fitting

- Properly fit athletes into the appropriate size & model NIKE shoe
- Provide recommendations to get athletes into the correct shoe type for their sport and biomechanics



High-Speed Accelerometers & Gyros

- Research grade instrumentation to answer novel sport-specific questions
- Equipment + staff to provide custom insights to medical staff & support team
- Accelerations / angular rates → on-field movement decomposition





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Pre-combine / Agility Testing

- Implement, measure, and interpret combine-like player testing
- Electronic timing gates & cameras
- Body-worn sensors for complete movement capture



Sensor Data Analysis

- Analyze, simplify, and reduce data overload
- Condense the myriad of sensor data streams (e.g., catapult and GPS) into actionable reports for coaches and staff
- Provide proper data aggregation and storage protocols

