Internship offer
M2 Musculo-Skeletal system, Locomotion, Exercise (MuSkLE)

Title of the Internship: Sex-differences in motor function, muscle activity, and skeletal muscle tissue mechanical properties following exercise-induced fatigue and recovery.

Laboratory: Laboratoire Interuniversitaire de Biologie de la Motricité (LIBM – UR 7424)

Research team: Sport Performance and Injury Prevention (SPIP)

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Project description

Scientific background and rationale: Muscle fatigue arises from a complex interplay of reversible central and peripheral neuromuscular mechanisms, resulting in a transient reduction in force- and movement-generating capacity and a concomitant decrease in skeletal muscle stiffness (Chalchat *et al.*, 2020). Biopsy-based analyses have shown that these fatigue-induced tissue adaptations are sex-dependent (Privett *et al.*, 2024). However, the temporal dynamics of changes in muscle mechanical properties during fatigue onset and recovery, and their sex-specific differences, remain unclear.

Aim/objective: This project aims to investigate in male and female participants: i) the effects of exercise-induced fatigue on muscle properties and function, and their recovery, in a lab-based setting, and ii) force-velocity-endurance profile in a field-based setting. The findings will provide new insights to inform sex-specific training and recovery strategies, with implications for performance optimization and for understanding sex-related differences in fatigability in both athletic and clinical populations.

Methods/Approach to be used: From a methodological perspective, the project will combine laboratory-based experiments using surface electromyography and ultrasound elastography during a fatigue protocol consisting of isokinetic concentric contractions. In field settings, force–velocity–endurance profiles will be assessed using an original running test (Vonderscher *et al.*, 2026). The experimental design will include the assessment of neuromuscular variables before, during, immediately after, and one day after exercise-induced fatigue in young healthy male and female participants. Forty participants (20 males and 20 females) will be recruited to detect potential sex differences (medium effect size [$\eta^2_p = 0.06$], $\alpha = 0.05$, $1 - \beta = 0.80$ ⇨ N = 34).

References: Chalchat *et al.* (2020) Frontiers in Physiology | Privett *et al.* (2024) Experimental Physiology | Vonderscher *et al.* (2026) European Journal of Applied Physiology.

Skills required: Background in sports sciences or human physiology, Computer programming and data processing. An experience in assessment of skeletal muscle structure and/or neuromuscular properties would be a plus.