FEDERAL UNIVERSITY OF SÃO CARLOS FOUNDATION

GRADUATE PROGRAM IN PHYSIOTHERAPY – PPGFt/CCBS/R

COURSE CHARACTERIZATION FORM

Graduate Program: Physiotherapy

Course Code: FIT-200

Credits: 2

Course Title: Musculoskeletal Ultrasonography

Start of Validity: 2025 – 1st Semester

Justification

The Musculoskeletal Ultrasonography course aims to train graduate students in the use of ultrasound as a tool for the assessment of the musculoskeletal system. Ultrasonography has become an imaging modality of great relevance in clinical practice and research, as it provides dynamic, real-time, noninvasive evaluation without ionizing radiation. The relevance of this course is justified by the increasing demand for imaging techniques that assist in the early detection of injuries, monitoring of rehabilitation, and enhancement of evidence-based practice. The course discusses the application of ultrasonography in the assessment of musculoskeletal structures and functions, including muscles, tendons, and fasciae, facilitating the understanding of mechanisms involved in healthy and pathological conditions. In the context of graduate education, the course contributes significantly to students' scientific and practical training by integrating research and clinical practice and by enabling the development of experimental and applied studies.

Course Workload

Theoretical Classes: 15 hours

Practical Classes: 15 hours

Exercises/Seminars: Not applicable

Course Syllabus

• Fundamentals of ultrasonography: physical and technical principles, types of transducers, acquisition parameters, and image optimization

• Morphological and mechanical variables of the musculoskeletal system: muscle architecture, tendon morphology, stiffness, Young's modulus, and echo intensity

• Image acquisition: static and dynamic imaging and standardization of procedures

• Image analysis and processing: quantification of variables, analysis software, and data extraction

• Elastography applied to the musculoskeletal system: principles and types (strain and shear wave elastography) and interpretation of elastography parameters

• Interpretation of results and clinical applications: relationships between ultrasound findings and clinical conditions, applications in physical training, rehabilitation, and injury prevention

• Image interpretation in healthy and pathological conditions, sex differences, and differences in body composition such as obesity

• Discussion of case studies and scientific articles

Nature of the Course

Elective course for both Master's and Doctoral programs.

Main Bibliography

Abe T, Kumagai K, Brechue WF. Fascicle length of leg muscles is greater in sprinters than distance runners. Med Sci Sports Exerc. 2000.

Aily JB et al. Evaluation of vastus lateralis architecture and strength in individuals with knee osteoarthritis. Clin Rheumatol. 2019.

Arampatzis A et al. Adaptational responses of the human Achilles tendon. J Exp Biol. 2007.

Bohm S et al. Human tendon adaptation to mechanical loading. Sports Med Open. 2015.

Dirrichs T et al. Shear wave elastography for monitoring tendinopathies. Acad Radiol. 2018.

Fede C et al. Morphometric and dynamic measurements of muscular fascia using ultrasound. Surg Radiol Anat. 2018.

Fischer A et al. Reliability of ultrasound for muscle and adipose tissue thickness. Eur J Clin Nutr. 2022.

Geremia JM et al. Triceps surae muscle architecture adaptations. Front Physiol. 2019.

Seynnes OR et al. Ultrasound-based testing of tendon mechanical properties. J Appl Physiol. 2015.

Main Responsible Faculty

Stela Marcia Mattiello – Permanent Faculty

Jeam Marcel Geremia – Visiting Faculty

Approval

Approved at the 290th Ordinary Meeting of the PPGFt Graduate Program Committee on February 14, 2025.

São Carlos, February 17, 2025.

Prof. Dr. Tatiana de Oliveira Sato

Chair of the PPGFt Graduate Program Committee – UFSCar