



**Microcirculatory Responses to Exercises and Mechanical Properties of Skeletal Muscles
and Tendons in Individuals with and without Type 2 Diabetes Mellitus –
Associations with Clinical Tests**

by

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5 Sassoon Road**

Abstract:

The research work aimed to measure and compare (1) the microcirculation, mechanical properties, and microcirculatory responses during muscle contractions of the muscles and tendons of participants with and without diabetes mellitus and (2) to determine correlations between their microcirculatory or mechanical properties and clinical or functional performance test results. Baseline measurements of the microcirculatory and mechanical properties of the rectus femoris and medial gastrocnemius muscles and patellar and Achilles tendons, as well as their microcirculatory variation during maximal isometric exercises, were performed and recorded. Results for various laboratory tests (including HbA_{1c}, triacylglycerol, high-density cholesterol), the Semmes-Weinstein monofilament test, a vibration test, and the ankle-brachial index were also obtained. Ninety participants with type 2 diabetes mellitus and forty-one physically matched controls were recruited. The baseline measurements indicated that, compared to the controls, the diabetic participants had lower oxygen saturation (StO₂) in their rectus and medial gastrocnemius muscles (both $P < 0.001$). The total hemoglobin (THb) in the diabetic patellar and Achilles tendons were also lower ($P = 0.001$ and $P = 0.01$). Furthermore, the medial gastrocnemius muscles of the diabetic group exhibited less stiffness ($P = 0.033$), and there were correlations between the microcirculatory values of the tendons and the laboratory and peripheral neurovascular test results. The study results demonstrate the effects of diabetes on the microcirculatory and mechanical properties of skeletal muscles and tendons during baseline measurements and responses to maximal isometric exercises. The correlations found between the microcirculatory and laboratory and peripheral neurovascular test results support the need for tissue-specific preventive strategies for diabetic complications.

Bio-sketch:

Prof. Wang is a Professor of Orthopedic Physical Therapy in the School and Graduate Institute of Physical Therapy of the National Taiwan University. He received his BSc in Physical Therapy from the Chung Shan Medical University, Taiwan (1986-1990). He obtained his MSc in Biomedical Sciences from the National Tsing Hua University in Taiwan (1993-1995), and MMedSci in Exercise Science from the University of Sheffield in the UK (1996-1997). He completed his Ph.D. training regarding Sports Medicine from the University of Sheffield, UK (1998-2000). In addition, he has completed a degree of Doctor of Physical Therapy at the Nova Southeastern University in the US in 2018. He was a Lecturer, Assistant Professor, Associate Professor at the National Taiwan University (2001-2015). Prof. Wang's research interests focus on identifying the mechanisms regarding neural control and mechanical properties of tendinous tissues that contribute to decreases in ankle force production and lower extremity dysfunction in patients with an Achilles tendinopathy or repair. He also specializes in the prevention and treatment of injuries that resulted from athletic activities. His current research projects focus on accelerating microcirculation and monitoring tendinous healing with portable devices. In addition, he participates in research involving the use of culture systems for stem cell culture to simulate mechanisms of metabolic or overuse disorders in the tendons. Prof. Wang sits on the National Examining Committee for Physiotherapist and National Science Council Committee for Rehabilitation 2015 (Taiwan).