

# Can Electrical Impedance Myography (EIM) be Used as an Objective Measure of Muscle Health?

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## Introduction

Manual muscle testing is acknowledged as being subjective. Patients with MND find manual muscle testing challenging as they become less able to move their muscles voluntarily and they develop coping mechanisms which can mask their muscle decline.

Unlike electromyography (EMG) electrical impedance myography (EIM) does not require any activity by the patient, impedance can be measured passively. This has the advantage of being more objective, less intrusive, and more acceptable to the patient.

This work sought to measure impedance in healthy volunteers to test two hypotheses:

1. The impedance of active and passive muscle is the same.
2. The impedance of muscle in younger and older adults is different.

The aim was to identify whether the impedance was different when the muscle was active or passive based on the concept that if it was not then this would improve objectivity if the muscle could not be voluntarily controlled. It also tested for an age-related change in impedance, assuming that muscle degrades with age as well as with neurological disease, thereby demonstrating poorer muscle health with age can be detected. The bicep brachii was chosen as it is an easily accessible visible muscle.

## Methods

Healthy volunteers (n=25) were recruited to the ethically approved research study.

At a single test visit, if they passed the eligibility checks, impedance along their right arm bicep brachii was measured using an ImpediMed SFB7 (ImpediMed, Australia) bioimpedance device.

Four sets of impedance measurements were made with each volunteer: relaxed, active bicep, relaxed, active bicep.

## Results

Age range: 18 to 82 years.

Testing hypothesis 1: Active and passive muscles have the same impedance. A significant difference was found. Reject this hypothesis.

Testing hypothesis 2: Impedance does vary with age. This has been tested with separating the ages into ranges: see Figure 1. Age is seen to have an effect on impedance.

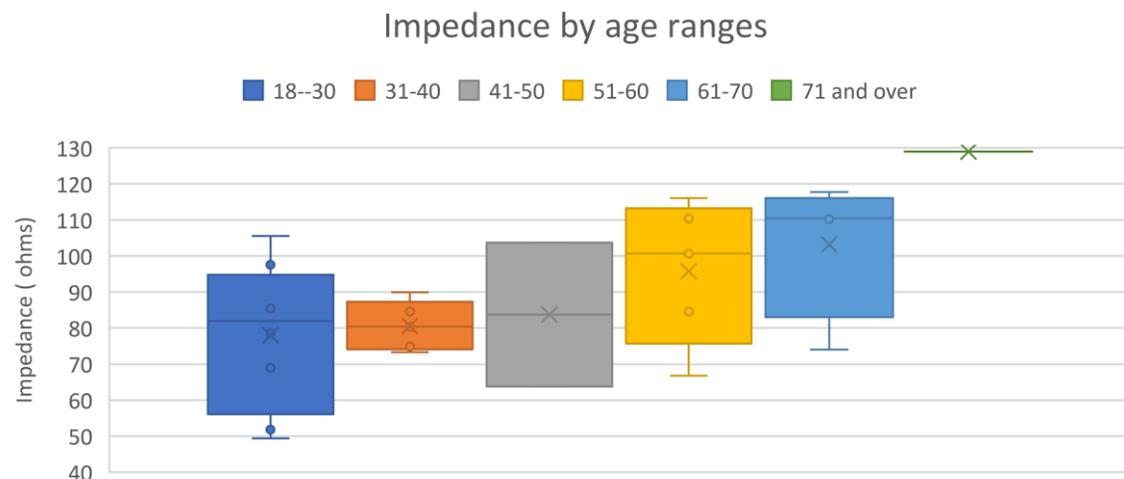


Figure 1: Impedance vs age

## Discussion

Further detailed data analysis is ongoing. Initial results show that there appears to be a difference in impedance between active and passive muscle. Anatomical and physiological features may account for this. Measurements of height, weight and waist were taken at the measurement visit and the Body Mass Index (BMI) and Relative Fat Mass (RFM) will be calculated. The impedance measurements may then be tested against approximations of body fat. Subcutaneous fat is expected to have an effect on impedance measures since surface electrodes were used.

## Conclusion and Recommendations

Impedance measured varied between active and passive muscle. Further investigation of experimental method and systematic errors is needed. A larger sample set to further explore the concepts would be of benefit.

## Acknowledgements

Thanks for the support of my healthy volunteers, my workplace and academic supervisors, my colleagues in Cardiff REU, and Cardiff and Vale UHB R&D department.