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The effect of hydration status on intracellular and extracellular water using bioelectrical impedance analysis measurements

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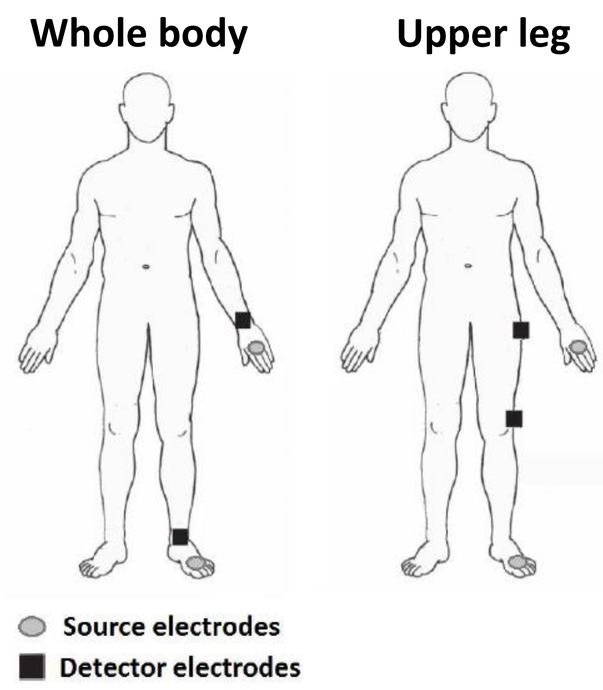
Aim

The aim of the study was to assess whether measurements of intracellular water (ICW) and extracellular water (ECW) in the upper-leg are less sensitive to changes in hydration status than measurements of the whole body, using single- (SF) and multi-frequency (MF) bioelectrical impedance analysis (BIA). SF is only able to measure ECW at 50 kHz, whereas MF is able to measure both ECW and ICW using 5, 50 and 200 kHz.

Methods

The impedance of upper-leg and whole-body was measured in:

- 30 healthy adults, mean age 25.5±8.3yrs, 51.7% women
- ECW: $\mathbf{Z_{50}}$ (50 kHz; **SF-BIA**)
- ICW: $\mathbf{Z_{200\text{-}5}} = 1/[(1/Z_{200}) - (1/Z_5)]$ (5kHz and 200kHz; **MF-BIA**)
- hydration states:
  A fasted with no use of the toilet
  B after use of toilet (reference state)
  C after toilet use and drinking 1 liter water



Main Findings

- **Intracellular water** was **not influenced** by **hydration status,** therefore *multi-frequency* BIA **is preferred** over *single-frequency* BIA to assess muscle mass.

- Upper-leg impedance was **not less sensitive** to changes in hydration status than whole –body impedance.

Results

ECW was significantly influenced by hydration status in both upper-leg and whole-body ($p<0.01$). ICW was not significantly influenced by hydration status ($p>0.05$), except for the upper leg measurement in situation A (without toilet use) ($p=0.015$).

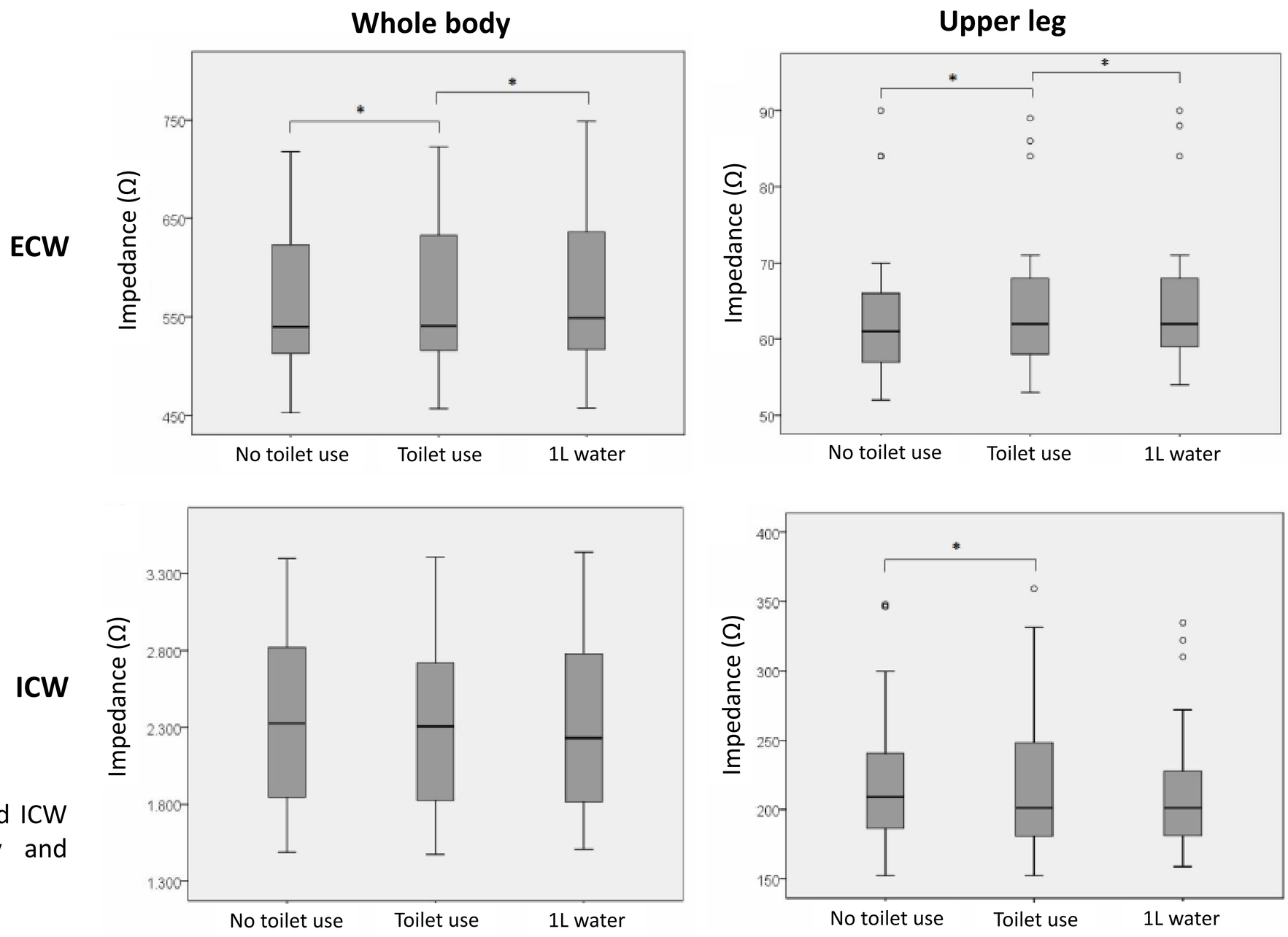


Figure 1. Boxplot of ECW and ICW impedance in whole body and upper leg. *$p<0.05$

This study is part of the ProIntens multicenter study

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