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Effects of respiratory disease and age in quadriceps muscle mass: a pilot study with ultrasonography

Paula Martins, Laura Noronha, Alexandra André, Cátia Paixão, Patrícia Rebelo, Ana Oliveira, Silvia De Francesco & Alda Marques

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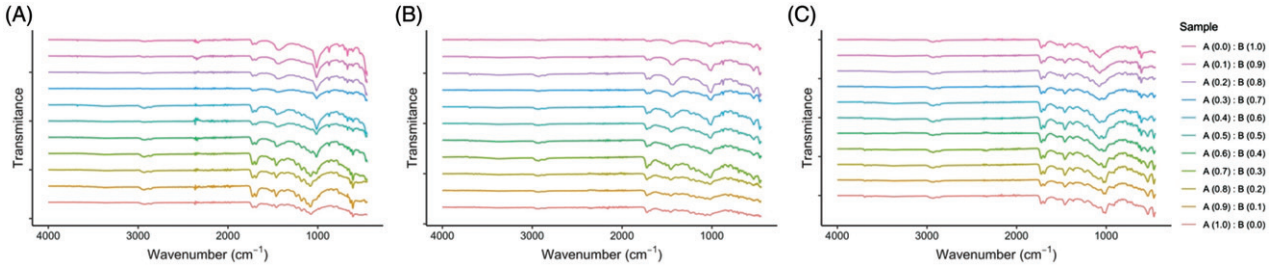

Figure 1. ATR-FTIR spectra of the isolated paints (top and bottom spectra), and of the mixtures at different ratios (middle spectra), where A) corresponds to a blue Volvo (A) and a red Renault (B); (B) to a blue Citröen (A) and a grey Skoda (B); (C) to a black Peugeot (A) and a grey Seat (B).

CONTACT Carlos Família carlosfamilia@egasmoniz.edu.pt

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Effects of respiratory disease and age in quadriceps muscle mass: a pilot study with ultrasonography

Paula Martins[a,b,c], Laura Noronha[b,d,e], Alexandra André[f], Cátia Paixão[b,e], Patrícia Rebelo[b,e], Ana Oliveira[a,b,e], Silvia De Francesco[a,c] and Alda Marques[a,b,e]

[a]School of Health Sciences (ESSUA), University of Aveiro, Aveiro, Portugal; [b]Institute of Biomedicine (iBiMED), University of Aveiro, Aveiro, Portugal; [c]Institute of Electronics and Informatics Engineering of Aveiro (IEETA), University of Aveiro, Aveiro, Portugal; [d]Universidade Luterana do Brasil, Canoas, Brasil; [e]Respiratory Research and Rehabilitation Laboratory - Lab3R – School of Health Sciences, University of Aveiro, Aveiro, Portugal; [f]Coimbra School of Health, Polytechnic Institute of Coimbra, Coimbra, Portugal

ABSTRACT

Introduction: Patients with chronic obstructive pulmonary disease (COPD) have been shown to present more muscle wasting than their healthy peers, which affects their quality of life [1,2]. The mechanisms behind muscle wasting in COPD are still little understood and even less is known in other chronic respiratory diseases (e.g. interstitial lung diseases – ILD) [3]. Ultrasound (US) is a safe and inexpensive imaging modality which can provide reliable measurements of muscle size and quality [2]. Thus, US may be a useful technique to enhance our understanding of muscle waste in chronic respiratory diseases. This study aimed to explore differences in quadriceps muscle mass in patients with COPD, hypersensitivity pneumonitis (ILD-HP) and healthy people (elderly and young).

Materials and methods: A cross-sectional pilot study was conducted with 10 patients with ILD-HP (68.4 ± 9.8yrs), 10 patients with COPD (69.4 ± 6.7yrs) and 10 healthy elderly volunteers (67.8 ± 8.7yrs). Groups were gender (5f/5m) and age matched. A group of 10 young university students (21.9 ± 3yrs) was also included. An US equipment (GE LOGIQ P6) with multifrequency linear probe (10–13 MHz) was used to obtain B-mode US images. The following measures were taken: Rectus Femoris Thickness (RF_T), Quadriceps Thickness (Q_T) and Rectus Femoris cross sectional area (RF_{CSA}). Data were analysed using SPSS version 24. Data normality and homogeneity were assessed. Between-group differences and correlations were performed with non-parametric tests (Kruskal–Wallis, Mann–Whitney *U*-test and Spearman's correlation coefficient). Statistical significance was set at .05.

Results: RF_{CSA} (median and IQR) was 5.44 [3.56–6.57] cm^2; 4.29 [3.58–4.50] cm^2; 6.06 [4.61–9.41] cm^2 and 7.99 [5.92–9.41] cm^2 for ILD-HP, COPD, elderly and young people, respectively. RF_T results were 1.51 [1.08–1.78] cm; 1.16 [1.07–1.53] cm; 1.64 [1.36–1.76] cm and 2.06 [1.68–2.27] cm, respectively. There were significant differences in RF_{CSA} ($p = .027$), RF_T ($p = .041$) and Q_T ($p = .011$) between COPD and elderly people. No differences were found between ILD-HP group and elderly. Significant differences between the elderly and young groups were found for the same measurements (RF_{CSA} $p = .034$; RF_T $p = .016$; Q_T $p = .034$). Moderate and negative correlations were found between age and RF_{CSA} ($r_s = -0.416$), RF_T ($r_s = -0.540$) and Q_T ($r_s = -0.450$). A strong and positive correlation was found between RF_T and RF_{CSA} ($r_s = 0.891$).
Discussion and conclusions: Our results seem to corroborate previous findings supporting the existence of quadriceps muscular wasting in patients with COPD when compared with age-matched healthy controls [2,4]. In the group of patients with ILD-HP, muscle mass seems to be somewhat preserved. To confirm our results, future studies should include a larger sample with quantitative measures of muscular quality (e.g. echointensity) and relationship between muscle size/quality and muscle strength.

CONTACT Paula Martins pmartins@ua.pt

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Proximity-aware interactive displays for rehabilitation centres

Afonso Faria, Stéphane Duarte, Daniel Simões Lopes and Hugo Nicolau

INESC-ID, Instituto Superior Técnico, Universidade de Lisboa, Lisbon, Portugal

ABSTRACT
Introduction: In clinical practice, physiotherapists often support 3–5 patients, simultaneously. They are frequently roaming throughout the room, switching between patients, taking notes, planning, demonstrating, coordinating, and monitoring multiple exercises. In such demanding environments, it is common for important events to go unnoticed. In light of this, context-aware computing – the ability to recognise people/activities and present timely information – can support rehabilitation practices for both clinicians and patients. Previous research proposed augmenting everyday objects to aid medical professionals [1] or using large interactive whiteboards that show situational information in operating rooms [2]. Nevertheless, the potential of context-aware computing remains largely unexplored in rehabilitation spaces as technologies fail to support the dynamic nature of clinical settings. In this work, we propose ARCADE, a proximity-aware system that leverages motion tracking and interactive displays to support patients' rehabilitation and provide meaningful and timely information to physiotherapists. The design of the system is grounded on the theory of proxemics [3]; particularly, we leveraged the concept of interpersonal distance (i.e. relative distance between two people) to adjust the information being displayed to both patient and professional. ARCADE is sensitive to 3 interpersonal distances: *intimate* (<0.5 m), *personal* (0.5–1.5m), and *social* (>1.5 m). When therapists are attending other patients (*social*), the information displayed can be adequately be seen from a distance, showing progress and whether the patient is performing the exercises correctly. When therapists move towards the patient (*personal*), the display changes smoothly to show critical performance information. Furthermore, therapists can use their hand as a virtual stethoscope to display detailed measures about a specific body segment/joint (*intimate*). The information being displayed at each interpersonal distance emerged from field studies with physiotherapists from local rehabilitation institutions. The user study aimed to answer two main research questions: