



# Functional capacity and health status in patient with chronic obstructive pulmonary disease

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**ABSTRACT**

**Introduction:** Marker-based motion tracking systems are the golden standard for human motion analysis, however such systems are expensive, non-portable and require long time subject preparation. The Kinect One sensor, being inexpensive, portable and markerless, appears as a reliable and valid alternative to the marker-based systems in several situations [1–3]. This sensor acquires depth image data and colour camera data that are processed by a tracking algorithm to estimate the three-dimensional position of twenty-five anatomical joints in real-time [4]. Nevertheless, the internal orientations of each anatomical segment are poorly estimated. The main objective of this work is to study the effectiveness of vector orthogonalization methods to estimate the relative internal orientations of the anatomical body segments using the skeletal data acquired by a Kinect One sensor.

**Materials and methods:** Twenty-eight young healthy adults ( $25 \pm 9$  yrs old,  $170 \pm 9$  cm height,  $61 \pm 9$  kg weight, 13 women) performed 5 repetitions of ten different elementary movements: shoulder flexion/hyperextension, shoulder abduction/adduction, shoulder transversal abduction/adduction, shoulder medial/lateral rotation, elbow flexion, forearm pronation/supination, hip flexion/hyperextension, hip abduction/adduction, knee flexion and hip medial/lateral rotation. On each repetition, the subject initiated the movement in an adapted pose of the anatomical reference position and once finished returned to the initial position. Data was collected, simultaneously, using a marker-based system (Qualysis – 100 Hz) and a markerless system (Kinect One – 30 Hz). All participants signed consent forms. The biomechanical model used was composed by eleven anatomical segments: the head, the chest, the abdomen and both arms, forearms, thighs and legs. Six different vector orthogonalization methods (Householder, Eberly, Square Plate, Spherical and Projection Matrix) were used to estimate the relative orientations of the anatomical body segments from Kinect One sensor model [5]. Pearson's correlation coefficient was used to compare the anatomical body segments orientations of all model segments obtained with both systems.

**Results:** The results obtained show that the six techniques implemented present a moderate to high correlation (0.58 – 0.93) between segments longitudinal axis of rotation while for the remaining axes (anterior-posterior and medial-lateral) they show a moderate to negligible correlation (–0.37 to 0.46). Additionally, the performance of each technique varies according the selected movement. For example, the Householder technique presents different correlation values when applied to the following movements, hip flexion (0.84), hip abduction (–0.05), knee flexion (0.78), shoulder flexion (0.36), elbow flexion (0.80) present relevant differences.

**Discussion and conclusions:** Although vector orthogonalization techniques are capable to estimate plausible orientations, the results given the same movement shows significant differences, suggesting that not all vector orthogonalization techniques are appropriate for all movements. Therefore, it is necessary to careful select the best technique for each movement in order to obtain valid results. Finally, it is possible to conclude that Kinect One shows good results for some kinematic variables, nevertheless, it needs to improve the precision on the estimation of the joints' position and all body segments' orientation in order to obtain results similar to marker-based systems.

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## Functional capacity and health status in patient with chronic obstructive pulmonary disease

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#### ABSTRACT

**Introduction:** The daily life of Chronic obstructive pulmonary disease (COPD) patients is characterised not only by chronic respiratory symptoms but also by exercise intolerance due to their breathlessness. Proper diagnosis and management of this disease consequently includes evaluation of exercise tolerance [1], frequently associated with a reduced functional exercise performance [2], thereby adversely affecting health status [3]. The purpose of this study is to analyse the impact of COPD on objectively-measured daily physical activity (DPA) through functional capacity and quality of life in these patients.

**Materials and methods:** An observational study was performed with inclusion of seventy one men with moderate COPD (FEV1 54.6±7.1%); age 63.8±3.1 yrs; weight, 71.2±8.3 kg; height, 169.0±8.1 cm constituted the COPD group (COPDG), and 150 healthy subjects, age 64.2±5.8 yrs; weight, 76.2±11.3 kg; height, 169.8±7.5 cm, were included as the healthy group – HG. The physical parameters assessed were strength, aerobic endurance, flexibility and agility/balance, by the Fullerton's functional fitness tests. The health status was evaluated through the Medical Outcomes 36-item Short Form Health Survey (SF-36) questionnaire. The study was approved by the Ethics Committee of the Garcia de Orta Hospital and all participants gave their informed consent.

**Results:** The values of the functional fitness test were significantly different ( $p < .05$ ) between COPDG and HG groups for the following variables all expressed in mean±SD: body mass index, 25.9±3 vs 27.7±4.1 kg.m<sup>2</sup>; 30-second chair stand 14.1±1.7 vs. 18.2±1.9 times; arm curl 15.7±2.8 vs. 18.8±4.9 times; 6-minute walk 498.8±58.3 vs. 589.7±88.6 m; 8-foot up-and-go 4.7±0.8 vs. 5.1±1 sec; chair sit-and-reach 0.81±9.9 vs. -7.1±10.6 cm respectively and no differences were observed for the back scratch test (DPOCG, -11.2±9.7 cm and HG, -12.7±11.6 cm). In health status DPOCG presented a significant decrease ( $p < .05$ ) on perception of all domains of SF-36, except on body pain.

**Discussion and conclusions:** In this study COPD patients have lower levels of functional capacity compared to healthy subjects. However, they were able to perform short tasks with higher speed. This trend was also evident in other study where COPD patients performed short term activities faster than healthy persons [4]. Limitation of activity and impaired quality of life are important outcomes of COPD and there is an association between physical activity and overall health status [5], which was also verified in this study. If functional capacity could be improved, by exercise training integrated in rehabilitation programs, probably we could also improve health status on these patients.

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## Infant massage programs for newborn babies: systematic review

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#### ABSTRACT

**Introduction:** Parenthood is a period of stress and great demand for parents. Taking care of a baby requires parental adjustment and behavioural development in order to satisfy child's needs. Infant massage is an important parental support strategy which enhances parent-child relationship and promotes baby's development [1]. This is a widely and effective technique used in preterm and term infants. In recent years, many studies showed several benefits, such as improved