
Dr. Iriz Levai, MD 1, Ms. Kathryn Kimber 1, Mr. Willem de Boer 2, Mr. John Beier 3, Dr. Richard Iles MD 1, Dr. Joan Lasenby 3,
1-Respiratory Paediatrics, Cambridge University Hospitals NHS Foundation Trust, CB20QQ; 2-R&D, PneumaCare Ltd, CB4OWS;
3-Signal Processing and Communications Laboratory, Cambridge University, CB21PZ Cambridge, UK.

Introduction

• Structured Light Plethysmography (SLP) and the SLP-based, the Thora 3Di™, is a non-invasive, non-contact method of assessing the movement of the rib cage and abdominal wall. SLP projects a grid of light onto the subject’s chest and abdomen, the movement of the grid allows both the analysis of compartment volume change and assessment of the surface motion.

• We present a novel method of breaking down the surface motion of tidal breathing that we believe to be able to characterise a subject’s healthy, diseased, or highly trained state.

• Aims and objectives: To use tidal breathing measurements to analyse respiratory movements and to categorise according to specific patterns.

Methods

• Tidal Breathing data was collected from 7 elite rowers after exercise (av Age 22) -- this was compared to 18 non-athletes otherwise healthy) (av Age 22)

• Surface modes for each subject were obtained using a tensor decomposition technique and used as characteristics of elite-athlete vs normal. The modes represent characteristic surfaces which each move according to given amplitude-time curves, and which combine linearly to make up the whole surface breathing pattern over time.

• Each dataset was classified using the other datasets as training data.

• Analysis of chest wall movement clearly indicates specific differences between the breathing patterns of elite athletes and normal non-athletes.

• The rowers have more complex breathing, with multiple sections of the chest moving separately, rather than in sync.

• This complexity leads to more structure in the lower two modes.

• The rowers are also very symmetric in their breathing patterns.

• Or best guess is that with greater fitness, especially in this case, comes better muscle control, which results in the symmetry we see.

• Surface movement analysis of other subject groups will be investigated as a next stage.

Bibliography


