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Title: Respiratory muscle activation and action during cough

Antonella 8931 LoMauro antonella.lomauro@polimi.it¹ and Prof. Andrea 8932 Aliverti andrea.aliverti@polimi.it¹. ¹ Dipartimento Di Elettronica, Informazione e Bioingegneria, Politecnico Di Milano, Milano, Italy .

Body: Cough is a defensive airway reflex consisting of a modified respiratory act which involves the sequential activation of several laryngeal and respiratory muscles. The contraction of the latter results in thoraco-abdominal volume variations in order to provide enough amount of air available, the operating volume (OV), to be expelled. We hypothesized that posture and OV could influence muscular activation and thoraco-abdominal displacements during voluntary cough. In 10 healthy subjects, we measured the surface electromyography (sEMG) activity of 7 muscles (scalene, sternocleidomastoid, parasternal, intercostal, diaphragm, external abdominal oblique and rectus abdominis) in supine and seated position during cough maneuvers performed at 4 different operating volumes measured by opto-electronic plethysmography: TLC, FRC and two volumes between TLC and FRC. The amplitude of sEMG signals resulted maximal at TLC ($p < 0.001$) and poorly affected by postures ($p > 0.05$) and by the other OV. Thoraco-abdominal volume variations during cough were unaffected by posture and OV as well, being predominantly thoracic (see figure in which only two representative muscles are shown for simplicity). Our results suggest that voluntary cough motor mechanism activates a synergetic antagonistic contraction of inspiratory and expiratory muscles leading to a specific thoraco-abdominal pattern, in which the rib cage is the predominant compartment.