

# Abstract

Patients diagnosed with sensory hyperreactivity, SHR, suffer from upper and lower airway symptoms like cough, difficulties to breathe and chest pain, induced by a variety of environmental irritants but also by cold air and physical effort. Their lung function tests show of normal values and specific asthma tests are usually negative. Capsaicin, the hot ingredient in hot peppers (capsicum), is known to stimulate the cough reflex in humans and is used to distinguish and diagnose this condition. SHR affects more than 6% of the Swedish population, mainly women and there is no pharmacotherapy to offer

**The overall aim** of this thesis was to elucidate different aspects of symptoms and reactions, from the airways and the chest that these patients seek medical attention for. Further to evaluate the effect of a physiotherapeutic intervention.

**Study I** evaluated the induced symptoms; physiological parameters and capsaicin cough sensitivity in 11 patients suffering from exercise induced dyspnoea (EID) and SHR, after exercise in cold air, compared to 11 matched healthy control subjects.

**Study II** evaluated sensitivity to capsaicin in 14 patients with SHR and chronic idiopathic cough after eucapnic voluntary hyperventilation (EVH) test with dry air in comparison to 10 healthy control subjects and in randomised order.

**Study III** evaluated chest mobility, respiratory movement and pain sensitivity in 35 patients with SHR compared to 32 patients with asthma, 19 patients with chronic obstructive pulmonary disease (COPD) and 28 alleged healthy control subjects.

**Study IV** evaluated in a randomized cross over design, the effect of a 12 week physiotherapeutic training program in 27 patients diagnosed with SHR.

**Main findings:** **I.** Provocation in cold air increases capsaicin cough sensitivity and decreases end-tidal CO<sub>2</sub> without affecting the lung function. **II.** When provoked with the EVH test, the cough sensitivity was down-regulated. **III.** The SHR patients had increased breathing frequency, reduced chest mobility and lower respiratory movement compared to both healthy control subjects and to patients with asthma. As well patients with asthma, COPD and SHR had significantly lower pain thresholds compared to the healthy controls. **IV.** A physiotherapeutic training program increased chest mobility and decreased subjective feeling of chest pressure after the training period. The capsaicin cough threshold for two coughs (C2) increased (improved) after the intervention period.

**In conclusion** Patients suffering from SHR have in many ways reactions differing from healthy control subjects and from patients with other airway diseases. However, in some aspects, like breathing symptoms, pain sensitivity and chest mobility, the findings in the variant airway diseases were overlapping each other. The airway symptoms and the increased cough sensitivity reported by the patients with SHR are reproducible in relation to exercise in cold air. On the other hand, in line with animal studies and results in healthy volunteers, dry air provocation has an opposite effect with a down-regulation of the cough sensitivity following the EVH test. That physiotherapeutic treatment turned out to be effective in enhancing chest mobility, decreasing chest symptoms and improving capsaicin cough sensitivity indicates a possibility to provide a treatment for these patients.

**Key words:** Airway Sensory Hyperreactivity-SHR, Breathing Movements, Chest Mobility, Pain Thresholds, Physical Therapy, Chemical Sensitivity, Cough, Capsaicin, Asthma, COPD.

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# Airway reactions and breathing movements in sensory hyperreactivity

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