

Selected topic: Exercise

BREATHE-(H)IT Trial protocol: High-intensity training to improve diaphragm functioning in persons with chronic nonspecific low back pain

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Introduction: Persons with chronic nonspecific low back pain (CNSLBP) benefit more from high-intensity training (HIT) compared to moderate-intensity training (MIT) to improve disease-related biopsychosocial outcomes. However, the underlying mechanisms for these effects are still unknown. A potential underlying mechanism is an improvement in diaphragm functioning. The diaphragm plays an important role in postural control, and impaired postural control due to diaphragm dysfunction has been associated with CNSLBP.

Purpose/Aim: To compare the effects of HIT with MIT on diaphragm functioning in persons with CNSLBP.

Materials and Methods: The study was registered at clinicaltrials.gov with trial registration number NCT05384457. Sixty-four participants with CNSLBP will be randomly assigned to a 12-week HIT- or MIT-program (24 sessions, 1.5h per session, twice per week). Both programs consist of cardiorespiratory-, limb strength-, and trunk strength training, and only differ in terms of exercise intensity. Primary outcomes are related to diaphragm functioning: Maximal inspiratory pressure (MIP) is used to quantify diaphragm strength. Diaphragm endurance is measured using a continuous threshold loading protocol (60% MIP), and time to task failure is recorded as diaphragm endurance time. The difference in MIP before and after (5 min, 15min, 30min) a maximal cardiopulmonary exercise test is defined as diaphragm fatigue. Diaphragm activation patterns are measured using surface electromyography during postural control tasks. Secondary outcomes include pain processing (quantitative sensory testing), exercise capacity, lumbar proprioceptive use during postural control, and questionnaires about pain intensity, disability, anxiety, and depression. Outcomes are assessed at baseline, during and immediately post-intervention, and at 3- and 12-month follow-up.

Results: This study started in September 2022. Currently, eight participants (4 males, age = 37.1y, SD = 13.0) were included. Baseline assessment is expected to be finalized in all participants in June 2024.

Conclusion(s): The Breathe-(H)IT Trial is the first study investigating the effects of HIT on diaphragm functioning in persons with CNSLBP, and will possibly reveal one of the working mechanisms of HIT.

Keywords: chronic nonspecific low back pain, high-intensity training, diaphragm