Acute responses to exercise in health and disease

# Mechanical unloading on thorax improves breathlessness during moderate intensity cycling in older adults with dyspnea on exertion

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Published Online: 12 MAY 2025

## Abstract

Background: Breathlessness is common among older adults, but it is often overlooked as “normal aging” or considered narrowly as a symptom of cardio-respiratory diseases, which places older adults at risk of unnecessary testing and treatment. Decreased chest wall compliance and age related shifted operational lung volumes could contribute to breathlessness during exercise in older adults. Therefore, we propose to investigate the hypothesis that mechanical unloading of the chest wall using an external cuirass (a plastic shell over the thorax) could alleviate breathlessness. METHOD: We evaluated 13 older adults (70±2 yr, 7F/6M, 29±6 kg/m2) with breathlessness (rating of perceived breathlessness [RPB] ≥3 during exercise). Each participants completed submaximal exercise test under two conditions: with the cuirass-attached and with continuous negative pressure (-20 cmH2O) applied via the cuirass to mechanically unload the chest wall. We measured RPB, operational lung volumes (end-expiratory lung volume [EELV] and end-inspiratory lung volume [EILV]), expiratory flow limitation (EFL), ventilation, and exercise capacity ($\dot{V}O_2$). Results: Compared with cuirass-attached condition, mechanical unloading revealed a decreasing trend in RPB during exercise (4±1 vs. 3±1, p=0.057). EELV and EILV increased significantly at rest (EELV: 55±8% vs. 61±11% total lung capacity [TLC]; EILV: 70±7% vs. 74±10% TLC, both $p<0.05$) but no significant changes were observed during exercise. EFL, ventilation, and $\dot{V}O_2$ remained unchanged at both rest and during exercise. Conclusion: Mechanical unloading of the thorax may

improve breathlessness in older adults during exercise. These findings may have broad and immediate clinical impact for the management of older adults, particularly those experiencing dyspnea on exertion.

supported by National Institutes of Health 18099

This abstract was presented at the American Physiology Summit 2025 and is only available in HTML format. There is no downloadable file or PDF version. The *Physiology* editorial board was not involved in the peer review process.

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