

# Weighted restraint associated with increased breathing difficulty

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Weighted restraint, which is used in law enforcement when officers apply their body weight to a subject to control their movements during

apprehension, is associated with increased breathing effort after physical exercise, according to a study published in *Scientific Reports*. The findings are based on model scenarios of different types of restraint tested in 17 healthy volunteers.

Mark Campbell and colleagues investigated the combined effects of physical exertion, prone positioning (lying down), restraint, and body compression on breathing and the distribution of air in the lungs by testing 17 volunteers in different experimental conditions. As part of the experiments, the volunteers exercised on a stationary bike at 70% of their maximum heart rate for three minutes before being asked to lie down on their front with their arms in one of three positions: at the side (control), or clasped in the small of the back or on the back of the head (restraint positions). The authors compared the positions after exercise with and without adding a [weight](#) of bagged sand which was 35% of the volunteers' own [body weight](#) between their shoulder blades.

The authors found that the volume of air remaining in the lungs after breathing out was smaller under the combined effects of weight, exercise, and lying down. The remaining volume of air continued to decrease throughout recovery from exercise for subjects in restraint positions but not the control position, which suggests that breathing required more effort in restrained subjects, likely because their abdominal muscles were needed to assist their inspiratory muscles. The authors suggest that, as the measured weight of 35% bodyweight is likely less than the weight an officer would need to apply to control a suspect, in true conditions of weighted restraint, the increasing effort to breathe may become relevant to the survival of the subject the longer the weight is applied.

**More information:** Campbell, M. et al, Thoracic weighting of restrained subjects during exhaustion recovery causes loss of lung reserve volume in a model of police arrest, *Sci Rep* (2021).

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