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STRUCTURAL AND FUNCTIONAL EFFECTS OF REACTIVE JUMPS ON SKELETAL MUSCLE IN LONG-TERM BED REST (RSL-STUDY, COLOGNE)

Abstract

Background Extended skeletal muscle inactivity (disuse) in bed rest results in considerable loss in muscle histomorphology with functional impairments that can be alleviated by physical exercise as countermeasure. **Objectives** To test the outcome of reactive jumps at supine position on human thigh and calf muscle histomorphology (myofiber size and type distribution) and other functional parameters (capillarity) in bed rest participants (60 days RSL study). **Methods** The male 60 days RSL study was sponsored by the European Space Agency (ESA) and organized by the DLR at the :envihab human physiology facility, Cologne, Germany in 2015-2016. The study ran in two campaigns, one bed rest (BR) control (BR-CTRL) and one exercise (BR-JUMP) group, each (n=12), finally resulting in total n=22 study participants subjected to muscle biopsies (VL, n=21; SOL, n=22). In both groups, muscle biopsies (approx. 150mg wet wt.) were taken from the thigh and calf muscle before (preBR), at end (endBR), and during 10 days of recovery (recovBR), frozen in liquid nitrogen and further analyzed according to routine histomorphometry (myofiber size and type distribution), histochemistry (SDH stain), and immunohistochemistry (anti-myosin heavy chain, MyHCI and II, PECAM) using conventional and confocal laser microscopy. **Results** 60 days of bedrest induced significant reductions in muscle cross sectional area (VL, p¡0,0001; SOL, p¡0,0001) and myofiber type transition with increased amount of hybrids (VL, p=0,0131; SOL, p¡0,0001). Fiber size changes were attenuated (VL, p¡0,0001; SOL, p¡0,0001) and muscle-specific myofiber type distribution was preserved in both VL and SOL by exercise in form of reactive jumps. **Conclusion** Reactive jumps are an appropriate countermeasure to prevent muscle loss following disuse during long-term bedrest. **Sponsors** ESA, Noordwijk, NL, DLR:envihab, Cologne, DLR e.V. / BMWi grant 50WB1421. **References** Kramer A. et al., PLoS ONE, 2017 (Study paper); Kramer et al., Sci. Rep. 7: 13177 (2017); Weber R. et al., ms. in preparation