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Universities Space Research Association[1], Houston, TX; University of Houston[2], Houston, TX; Wyle Integrated Science and Engineering[3], Houston, TX; Syracuse University[4], Syracuse, NY; NASA Johnson Space Center Exercise Physiology and Countermeasures Laboratory[5], Houston, TX; NASA Johnson Space Center Biostatistics Laboratory[6], Houston, TX; NASA Johnson Space Center Neuroscience Laboratory[7], Houston, TX.

Novel Analog For Muscle Deconditioning

Existing models of muscle deconditioning are cumbersome and expensive (ex: bedrest). We propose a new model utilizing a weighted suit to manipulate strength, power or endurance (function) relative to body weight (BW).

Methods: 20 subjects performed 7 occupational astronaut tasks while wearing a suit weighted with 0-120% of BW. Models of the full relationship between muscle function/BW and task completion time were developed using fractional polynomial regression and verified by the addition of pre- and post-flight astronaut performance data using the same tasks. Spline regression was used to identify muscle function thresholds below which task performance was impaired.

Results: Thresholds of performance decline were identified for each task. Seated egress & walk (most difficult task) showed thresholds of: leg press (LP) isometric peak force/BW of 18 N/kg, LP power/BW of 18 W/kg, LP work/ BW of 79 J/kg, knee extension (KE) isokinetic/BW of 6 Nm/Kg and KE torque/BW of 1.9 Nm/kg.

Conclusions: Laboratory manipulation of strength / BW has promise as an appropriate analog for spaceflight-induced loss of muscle function for predicting occupational task performance and establishing operationally relevant exercise targets.

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Comment [KLE1]: It probably isn't a big deal, but I think it would be easier to read the affiliations if the superscript number was at the beginning instead of the end.

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Conclusions: Laboratory manipulation of relative strength ~~/ BW~~ has promise as an appropriate analog for spaceflight-induced loss of muscle function for predicting occupational task performance and establishing operationally relevant exercise targets.

Comment [KLE2]: What is the difference between these two?