

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Human Health : Countermeasures (2)

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A CRITICAL BENEFIT ANALYSIS OF ARTIFICIAL GRAVITY AS A MICROGRAVITY
COUNTERMEASURE**Abstract**

Deconditioning of astronauts during long duration spaceflight, especially with regard to the cardiovascular, musculo-skeletal, and neurological systems, is a well-recognized problem that has stimulated significant investments in countermeasure research over the past five decades. Because of its potential salutary effects on all of these systems, artificial gravity via centrifugation has been one of the most persistently discussed countermeasures; however, to date, few studies have tested its efficacy, particularly in comparison to other, system-specific countermeasures. This paper reports results of a meta analysis we performed to compare previously published results from artificial gravity studies with those from studies utilizing traditional countermeasures, such as resistive exercise, aerobic exercise, Lower Body Negative Pressure (LBNP), or pharmaceuticals. Published and non-published literature involving human bed rest and immersion studies, human non-bed rest studies, animal studies, and flight data were examined. Our analyses were confounded by differences in research design from study-to study, including subject selection criteria, deconditioning paradigm, physiological systems assessed, and dependent measures employed. Nevertheless we were able to draw comparisons between studies that normalize these variables. Results indicate that an artificial gravity-based countermeasure appears to be more beneficial for prolonged spaceflight than traditional countermeasures. Gaps in the current knowledge of artificial gravity are identified and provide the basis for a discussion of future topics for ground-based research using this countermeasure.