QUANTIFYING CALORIC EXPENDITURE DURING ZERO-G EXERCISE

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BACKGROUND:

Exercise is a fundamental component of maintaining astronaut health on long-duration space missions, where the microgravity environment poses unique challenges to physiological homeostasis. Accurate quantification of energy expenditure during such exercises is crucial for optimizing nutritional and physical health strategies for spacefarers.

OBJECTIVE:

This study aims to develop a comprehensive model to estimate caloric expenditure during exercise in a microgravity environment, employing a combination of spirometry, heart rate data, and other relevant parameters. By assessing energy utilization under these conditions, we seek to facilitate enhanced health management protocols for astronauts in space.

METHODS & OUTCOMES:

A multivariate predictive model will be constructed, utilizing spirometry and heart rate data, coupled with additional physiological and environmental parameters. A systematic approach will be applied to analyze the relationship between these variables and energy expenditure during various exercises. The proposed model will subsequently undergo rigorous validation to ensure accuracy and reliability. This research is expected to yield a precise and reliable predictive model, contributing to improved strategies for exercise prescription and nutritional intake, addressing the unique challenges presented by microgravity environments. We anticipate that our findings will support the development of more effective health maintenance protocols for astronauts during extended space missions, mitigating the adverse effects of space travel on the human body.

SIGNIFICANCE:

The development of an accurate and adaptable model to quantify caloric expenditure during exercise in space represents a pivotal advancement in space medicine. The insights gained from this study have the potential to inform the design of enhanced health and wellness strategies, ensuring the well-being and operational effectiveness of astronauts in long-duration space missions.