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A Mathematical Model of the Effects of Resistance Training on Body Composition

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Presenter Information

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Abstract:

Current clinical weight-loss interventions have poor long-term outcomes, making the mechanisms of body weight maintenance a question of considerable medical interest. We hypothesize that resistance training (RT) should aid in the maintenance of a healthy body composition by preserving lean mass and metabolic rate. To evaluate this, we extended an energy balance model of human metabolism developed by Hall et al. to include response to RT. We first looked at a case study by fitting the model parameters to a particular individual and simulating a RT program. We then explored the role of the lean mass gain term by varying the parameters controlling it using Latin Hypercube Sampling (LHS) to model variation in responses to RT training. We compared model results and determined that the model is able to reproduce the time course of lean body mass change in response to RT and, further, demonstrate how the model can be used to generate a simulated cohort for in silico clinical studies. Elderly populations, whether frail or obese, can also benefit from RT as a means to combat sarcopenia, (aging-related muscle loss) that can result in debilitating injuries. We therefore fit the model to data from an elderly population on a RT program using MATLAB to explore the role of RT in changes in body composition.