#2: Low Resting Metabolic Rate in Exercise-Associated Amenorrhea is Not Due to a Reduced Proportion of Energetically Expensive Tissue Compartments

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Energy deficiency in exercising women is associated with menstrual disturbances and a concomitant reduction in resting metabolic rate (RMR) when expressed relative to body size or lean mass. It remains unknown whether this apparent RMR suppression is a consequence of a reduction in metabolically active tissue compartments during energy deficiency or due to metabolic adaptations at the tissue level.

Purpose: To explore whether the reduced RMR in women with exercise-associated amenorrhea is explained by a lower proportion of energetically expensive tissue compartments or the result of metabolic adaptations.

Methods: RMR and metabolic tissue compartments were compared among exercising women with amenorrhea (AMEN, n=42) and eumenorrheic, ovulatory menstrual cycles (OV, n=37). RMR was measured using indirect calorimetry and predicted from metabolic tissue compartments as measured by dual-energy X-ray absorptiometry (DXA).

Results: Measured RMR was lower than DXA-predicted RMR in AMEN (1215Â±31 vs. 1327Â±18 kcal/d, $p<0.001$) but not in OV (1284Â±24 vs. 1252Â±17, $p=0.16$), resulting in a lower ratio of measured to DXA-predicted RMR in AMEN vs. OV (91Â±2% vs. 103Â±2%, $p<0.001$). Total triiodothyronine was also reduced in AMEN when compared with OV (80.1Â±3.4 vs. 92.4Â±2.1 ng/dL, $p=0.003$). Residual mass was greater ($p<0.001$) and adipose tissue was reduced ($p=0.003$) in AMEN when compared to OV. Brain, skeletal muscle, and bone mass were not different among groups.

Conclusion: Our findings suggest that RMR suppression in exercise-associated amenorrhea is not the result of a reduced size of energetically expensive tissue compartments but due to metabolic adaptations at the tissue level that are indicative of energy conservation.