Metabolic and Hemodynamic Changes Following 12 Months of Weight Loss

Brurya Tal[1,2] • Gabi Shefer[1,2,3] • Jessica Sack[1,2,3] • Yonit Marcus[1,2,3] • Yael Sofer[1,2,3] • Marianna Yaron[1,2,3] • Limor Ben Haim[1,2,3] • Roy Eldor[1,2,3] • Yona Greenman[1,2,3] • Naftali Stern[1,3]

1. The Sagol Center for the Metabolic Syndrome, Tel Aviv-Sourasky University Medical Center
2. Institute of Endocrinology, Metabolism and Hypertension, Tel Aviv-Sourasky University Medical Center
3. Gray Faculty of Medical & Health Sciences, Tel Aviv University, Tel-Aviv, Israel

Background

Resting metabolic rate (RMR) is a major component of total energy expenditure and is influenced by body size and composition. We evaluated 12-month changes in anthropometric measures, body composition, RMR, and blood pressure, and examined whether changes in lean-mass or fat-mass percentage were associated with changes in RMR.

Methods

This longitudinal analysis included 66 adults with metabolic obesity who participated in a 1-year weight-loss program. Participants received recommendations for a moderately calorie-restricted, high-protein Mediterranean diet and moderate physical activity. Anthropometric measures, body composition by dual-energy X-ray absorptiometry (DEXA), RMR by indirect calorimetry, and 24 hours ambulatory blood pressure were assessed at baseline and after 12 months. Continuous variables are presented as mean±SD. Within-participant changes were evaluated using paired-samples t tests in participants with complete paired data. Pearson correlations were used to assess associations between RMR and systolic and diastolic blood pressure at each time point, and between 12-month changes in body-composition percentages and RMR. Statistical significance was defined as $p<0.05$.

Results

- Mean age was 53.8±11.3 years; 37 participants (56%) were men and 29 (44%) were women. Weight decreased from 98.12±16.67 to 89.23±16.86 kg (mean reduction, 8.89 kg; $p<0.001$), and BMI decreased from 34.06±3.87 to 30.94±4.02 kg/m² (mean reduction, 3.12 kg/m²; $p<0.001$). The fraction of lean mass increased from 58.58±6.72% to 62.6±8.4%, while fat-mass fraction decreased from 40.2±6.6% to 36.3±8.2% ($p<0.001$ for both).
- RMR decreased from 1876±425 to 1769±354 kcal/day ($p=0.013$). Systolic blood pressure decreased from 123.5±10.2 to 120±9.4 mmHg ($p=0.099$), and diastolic blood pressure decreased from 74.9±8.1 to 72.8±8.2 mmHg ($p=0.055$). Changes in RMR were not correlated with changes in lean-mass percentage ($r=-0.265$; $p=0.098$) and fat-mass percentage ($r=0.268$; $p=0.095$). At baseline, RMR was nearly significantly correlated with systolic ($r=0.256$; $p=0.060$) but not with diastolic blood pressure ($r=0.223$; $p=0.101$). At 12 months, RMR was positively correlated with systolic ($r=0.404$; $p=0.002$) and diastolic blood pressure ($r=0.330$; $p=0.015$).

Figure 1. Pearson Correlations between RMR and Blood Pressure

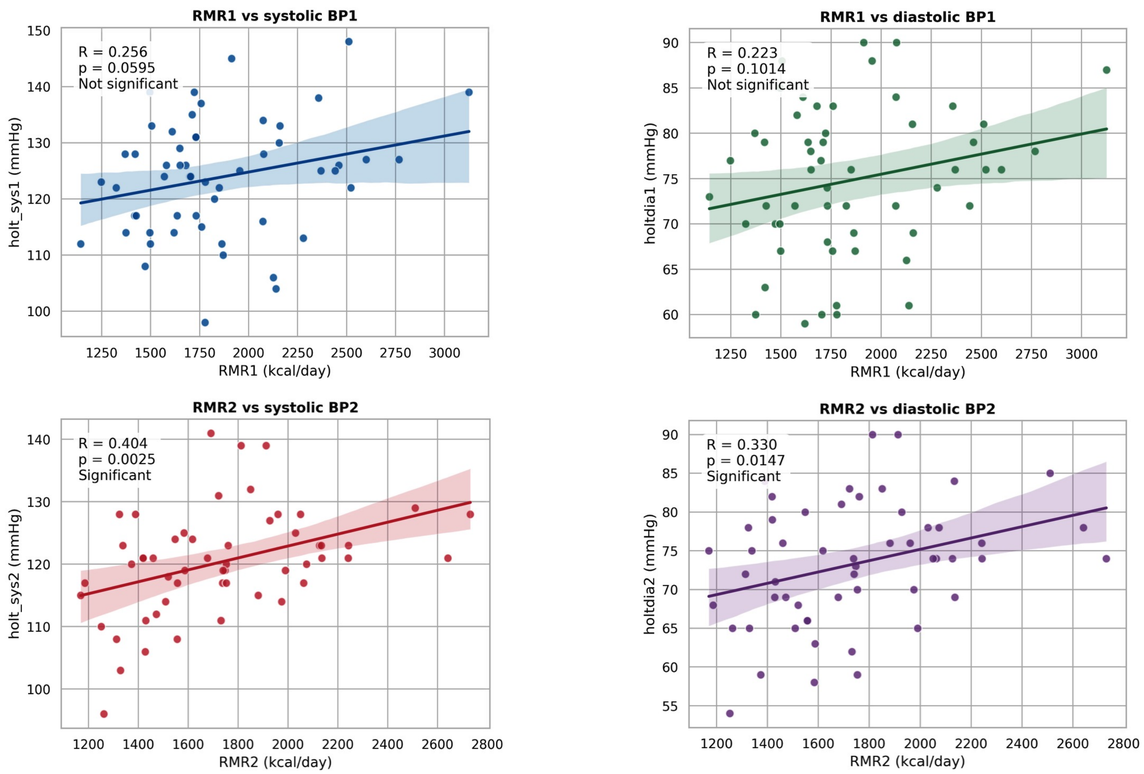
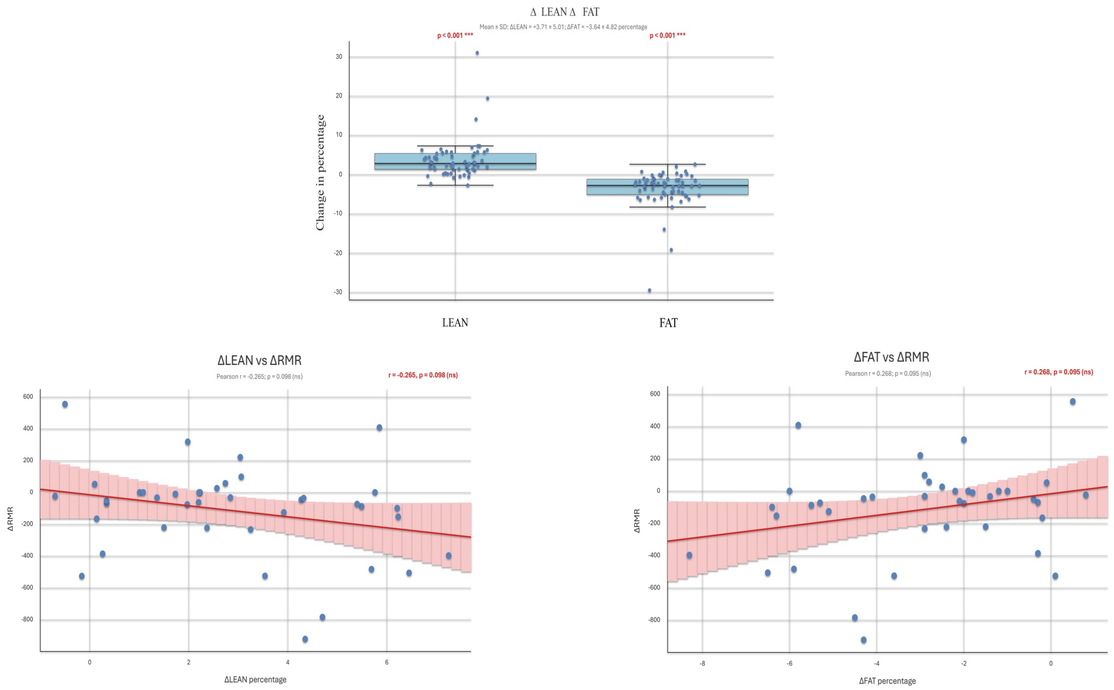


Figure 2. RMR and Body Composition



Conclusions

Over 12 months, weight-loss treatment was associated with significant reductions in weight, BMI, and RMR, together with a favorable shift in relative body composition. The decrease in RMR was weakly associated with changes in lean-mass or fat-mass percentage, suggesting that relative body-composition changes did not explain the observed reduction in RMR. Although reductions in blood pressure did not reach statistical significance, higher RMR was associated with higher systolic and diastolic blood pressure after treatment.