Could it be that Exercise is Counterproductive?

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Introduction

Many people exercise in order to control their weight. When this occurs, the body exhibits an energy compensation such that it is stored as fat in the body (Riou et al., 2014). This change in energy is measured in many ways including DEXA (Dual Energy Xray Absorptiometry) and FFM (Free Fat Mass). However, the methods are not all equivalent. Energy compensation was defined as the feedback mechanism from the body in order to accommodate the changes after training by accumulating energy.

The goals of this experiment were:
1) To determine the predictors for energy compensation from the given data (Riou et al., 2015)
2) To determine if, by narrowing the studies down to using DEXA, there is a difference in results observed.

Methodology

The majority of this experiment was carried out using R, a statistical vector-based computer program. Initially it was not known if any variables were significantly correlated. Given a spreadsheet of data collected, only results obtained from DEXA were used. The following flow chart describes the process in steps.

Correlation Analysis
An initial step to observe whether or not any variables could be predictors for compensation

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Multiple Linear Regression
Identifying any significant predictors

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Assess Linear Model
Verify for any interaction between predictors

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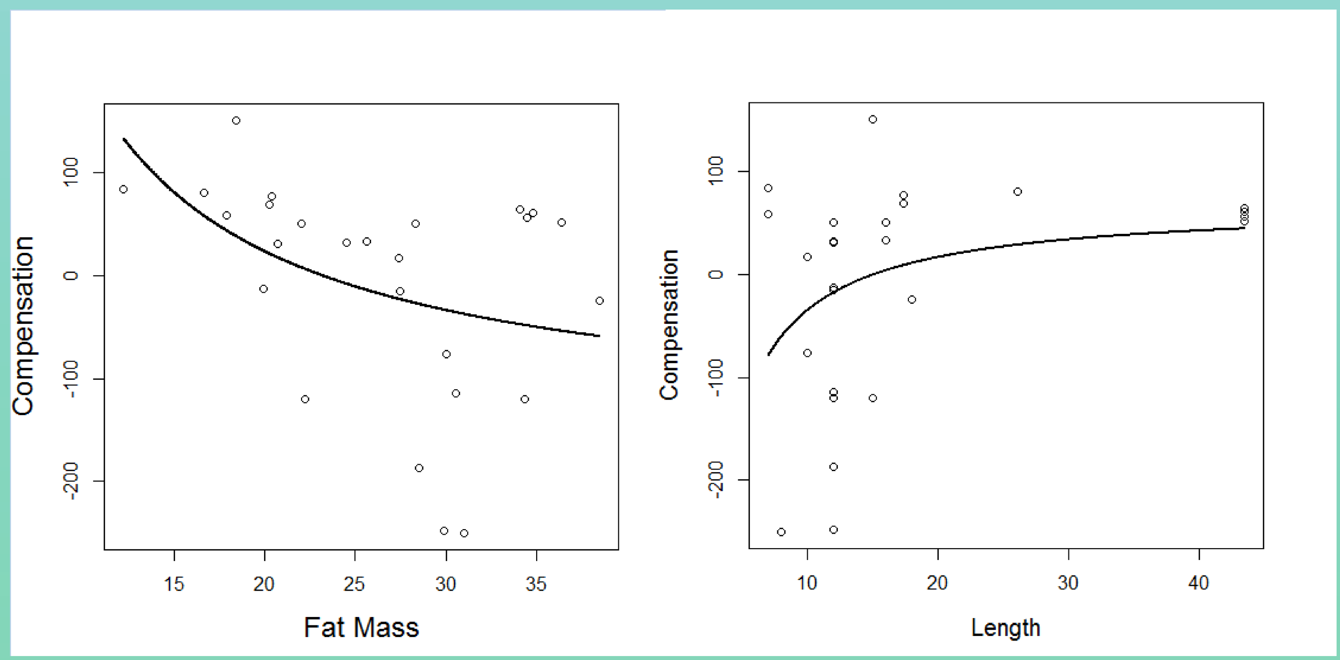
Assess Influence
If there are potential outliers, how does this change the results?

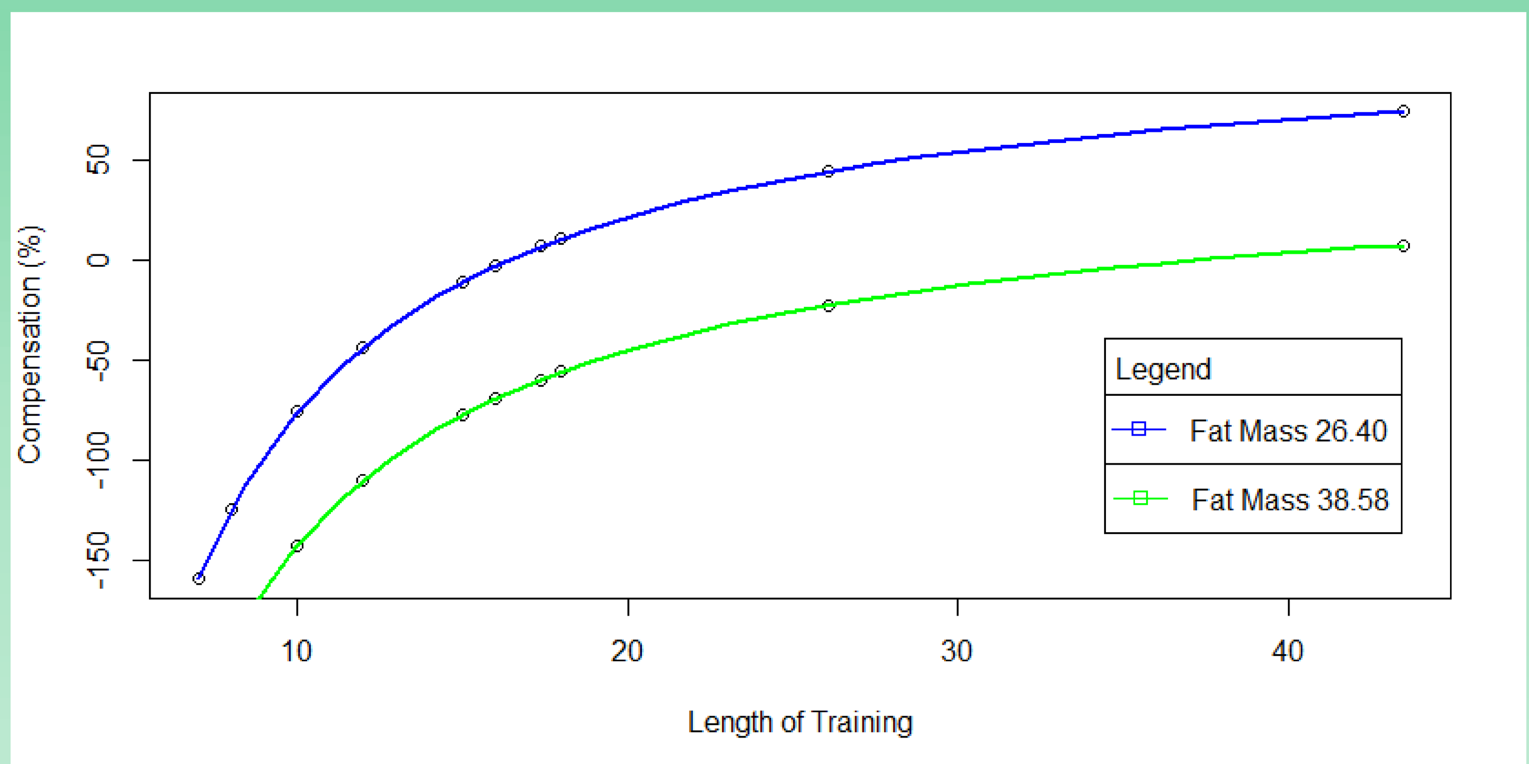
	Compensation
Age	0.5361
Frequency	0.4798
Length	0.0733
Dose	0.2045
Fat Mass	0.0623

Significance of possible predictors. The values indicated are p-values, where the hypothesis is such that the predictors are not significant. Only Length (the duration of training) and Fat Mass were determined to be correlated with Compensation.

Results & Discussion



Compensation as a function of Fat Mass and Length. Both predictors, Fat Mass and Length, are inversely related to Compensation. The relevant asymptote lies at 100% compensation.

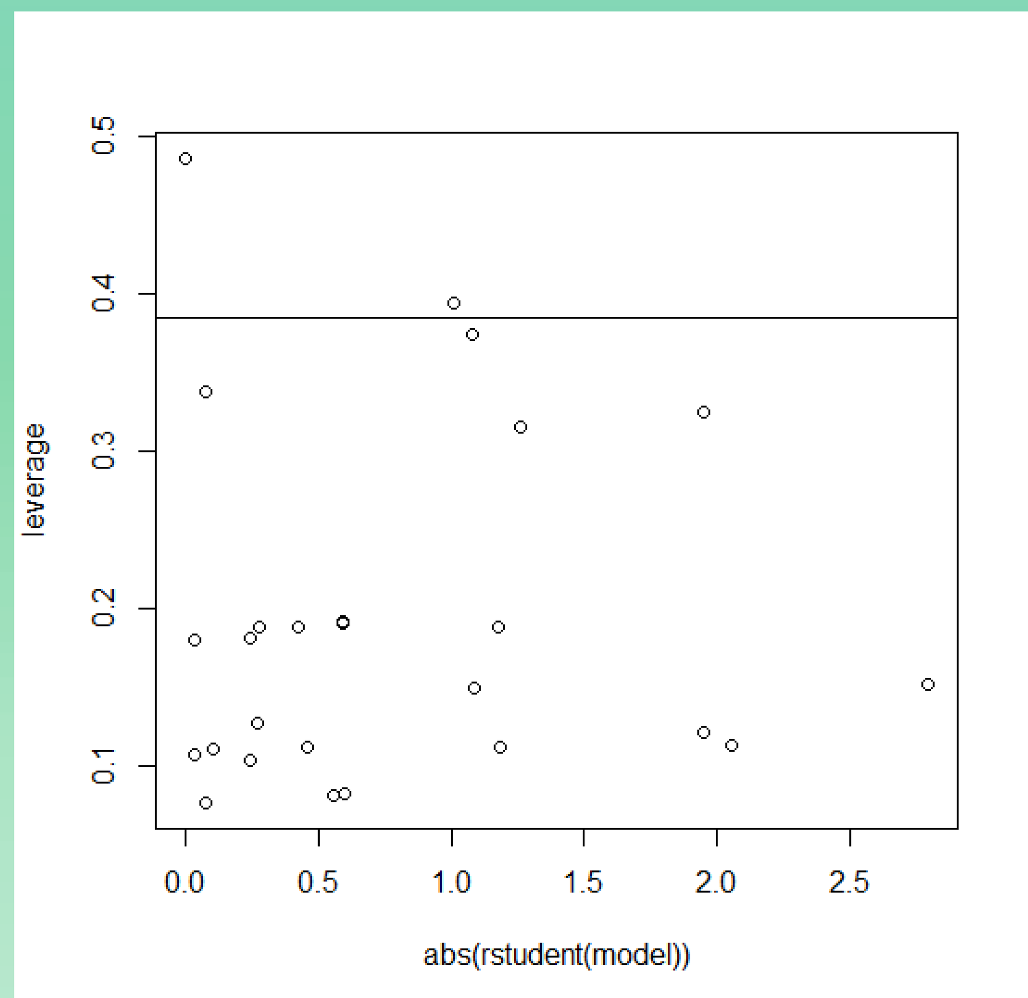


Level curves for Length vs Compensation. This graph shows the interaction between Length and Fat Mass. Fat Mass was controlled at its min and mean while the max value gave a curve too large to be incorporated on this scale.

Only two predictors remained significant after fitting the model and controlling for confounding. The resultant model was given as:

$$\%\ Compensation = \beta_0 + \beta_1 \frac{1}{Fat\ Mass} + \beta_2 \frac{1}{Length}$$

The major predictors only yielded a linear curve when taking the reciprocals. While the reciprocal predictors do not show interactions, the non-modified predictors do.



Leverage analysis. Two values were seen to have a large pull on the regressions. However, when removing the points to analyse changes, the regressions remained the same.

Conclusions

- Only Length and Fat Mass are significant predictors after fitting the model
- As Length increases, compensation reaches 100%
- Low initial fat masses tend to have high compensation; high initial fat masses have low compensations
- Length and Fat Mass exhibit some form of interactions
- Despite a strong leverage point, the influence did not change the regression significantly

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Marie-Eve Riou, Simon Jomphe-Tremblay, Gilles Lamothe, Dawn Stacey, Agnieszka `Szczotka and Eric Doucet: ´ Predictors of Energy Compensation during Exercise In-terventions - A Systematic Review. Submitted to Nutrients in 2014.