A data driven approach to explore the link between metabolomics and diabetes relevant outcomes after bariatric surgery

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Objective

Bariatric surgery is currently the most effective and radical treatment for obesity. The metabolite profile of patients changes remarkably soon after this surgery.

Our overall aim was to explore the short-term effects of bariatric surgery on the metabolite profile with regard to diabetes relevant outcomes such as insulin resistance and ß-cell function with a data driven approach.

Methods

75 serum samples from 25 patients before, after hospital discharge and 1 year after the surgery were measured by LC-HRMS (HILIC-QExactive). Data were processed with XCMS and normalized through Quantile Regression on QCs. Features selection and dimension reduction was done through a combination of univariate and multivariate statistical methods including Random Forests Models. The glucose infusion rate (GIR) was measured during a hyperinsulinaemic euglycaemic clamp, which is the gold standard for insulin resistance measurement. The relation between diabetes relevant outcomes and metabolomics was analysed by Partial Least Squares Regression Models (PLSR).

Results

109 features including branched-chain-amino-acids, creatine and long-chain-fatty-acids were identified as discriminatory features for short-term effects. These features were further processed in cross-validated PLSRs (10 components) where 73% of the GIR-variance and 70% of bodyweight-variance were explained. Linear mixed effect models of representative features will be performed in the future.

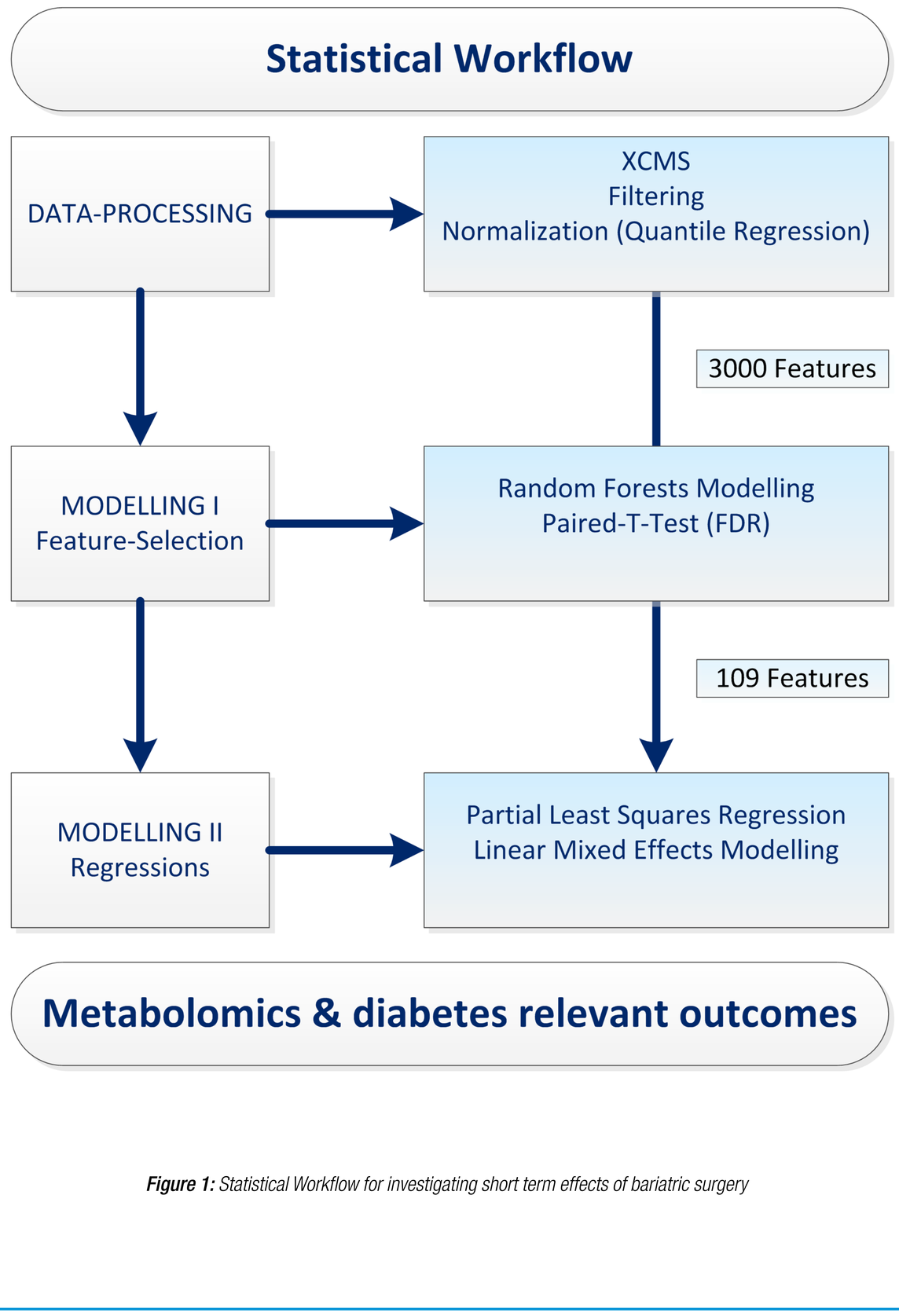

Figure 1: *Statistical Workflow for investigating short term effects of bariatric surgery*

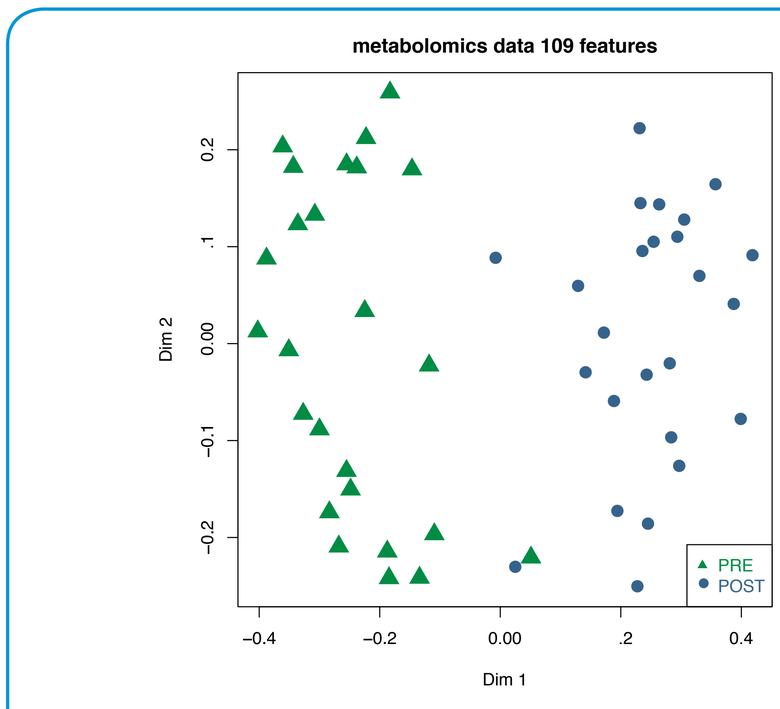

Figure 2: *MDS-Plot from unsupervised Random Forests Model*

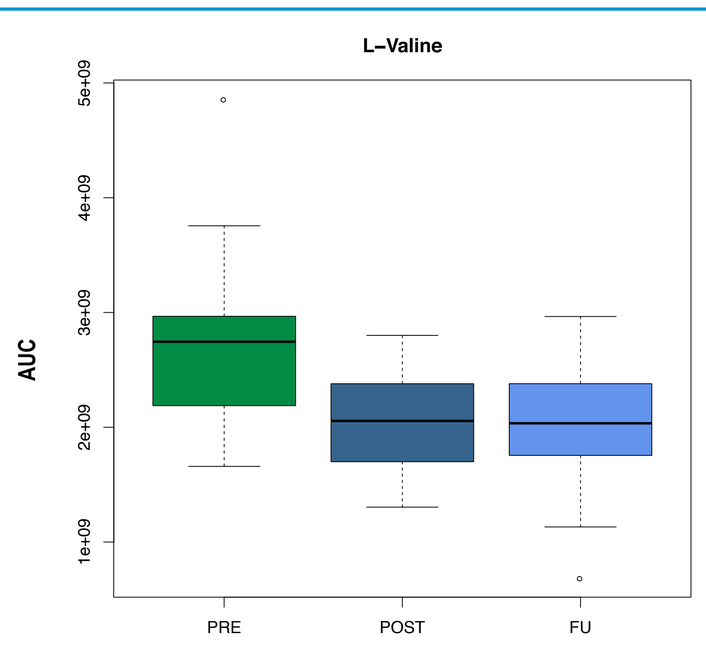

Figure 3: *Intensities of Valine, before, after the surgery and one year passed*

Acknowledgement

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