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Application of repeated measurement ANOVA models using SAS and SPSS: examination of the effect of intravenous lactate infusion in Alzheimer's disease

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Repeated measures analysis of variance (ANOVA) generalizes Student's t-test for paired samples. It is used when an outcome variable of interest is measured repeatedly over time or under different experimental conditions on the same subject.

The most commonly applied methods use the general linear models (GLM). There are univariate ANOVA models where a special form of the covariance matrix is supposed and multivariate models were repeated measures are considered as co-ordinates of a multidimensional vector. One big problem with these methods is that missing values cannot be handled: a missing value of one measurement of a subject results in the deletion of that subject from the analysis entirely. The use of mixed models has several advantages. This method of modelling can handle missing values, the structure of standard deviations and correlation (covariance matrix) can be modelled. Mixed models are not especially new but most of the statistical textbooks do not yet include discussion of mixed models. Smaller statistical software does not contain programs for mixed models.

The PROC MIXED of SAS fits a variety of mixed linear models and so they have became one of the most frequently used and sited programs (1,2). SPSS (3) contains various GLM models and the program Variance Components is appropriate for analysis of mixed models for univariate repeated measures.

Repeated measures ANOVA was used to investigate the effect of intravenous Na-lactate on cerebral blood flow (CBF) and related metabolic parameters in Alzheimer's dementia (AD) probands in order to assess vascular reactivity in the AD brain. Intravenous Na-lactate could provoke increased CBF in normal subjects and adults with panic disorder (4), sometimes with concomitant panic attacts. The experimental design was a self-control study, the serum lactate level, blood pressure, venous blood pH, pCO_2 and bicarbonate, and serum cortisol levels were measured at 0, 10 and 20 minutes after 0.9 % NaCl or 0.5 M Na-lactate infusion on two separate days.

There were two repeated measures factors: days with 2 levels (NaCl or Na-lactate) and time with 3 levels (0,10 and 20 minutes); time nested in situation. SAS and SPSS procedure statements will be shown. As a result, the serum lactate levels increased from 0.8 mmol/L to 4.6 mmol/L and 6.1 mmol/L 10 and 20 minutes after the Na-lactate infusion, respectively. Compensatory changes were found in the venous blood pH, pCO2 and HCO_3 levels.

References:

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