

Quality Monitoring and Analysis of Open Field Behavior in Rats by Means of Multivariate Analysis

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ABSTRACT

Day to day variation among investigated objects, environmental disturbances and artifacts arising from hardware and data management systems, constitutes challenges to the quality of locomotor activity (LMA) data. We aim to demonstrate how multivariate analysis (MVA) can be applied for both quality monitoring and analysis enhancement of experimental data. To our knowledge, quality monitoring of animal experiments are in general almost absent and we are not aware of any commercial providers of equipment that provides good quality monitoring tools. The rationales for quality monitoring are several, most importantly, without comparable results between experiments it's usually impossible to draw conclusions of value. Even with a huge effort to keep experimental parameters as constant as possible there will probably be a relatively large day to day variation. If a lot of technicians are involved doing experiments and if we need to perform these kind of experiments on a daily basis both differences in the result between weekdays and between persons that perform the experiments are obvious factors to investigate as well as seasonal effects and a multitude of other factors. Other areas of investigation is the reliability of the equipment and to monitor and take care of unrealistic artifactual values. We would also like to know that our behavioral variables have a broad description of behavior (i.e. not only variables that have a strong correlation to activity). Finally, none of our efforts would be worth it if we couldn't replicate our trials and receive a similar result between replicates. This demand us to have sharp and reliable tools to evaluate our experiments. This novel method for quality monitoring has been developed in-house and has never before been published on behavioral

data even though the methodology previously has been described [1] for other types of data (neurochemical indices).

The locomotor analysis system consists of eight motility meters with infrared beams (25Hz) in two levels for horizontal and vertical measures. Data quality is monitored in a semi-automated system. First an automatic software filtering is applied to check for data consistency in format and magnitude. Secondly 308 locomotor variables are automatically calculated from the 25Hz data generating LMA patterns for each individual. MVA monitoring of quality is performed by manually evaluating the control animals in each new experiment in relation to historic controls (n>5000) in a number of automatically generated multivariate models. Outlier animals are marked as "weak" or "severe" as well as the whole experiment (good/no good). The LMA patterns are further used for MVA of treatment effects on both a single- and multiple number experimental level [2,3].

The experiments were approved by the Local Animal Ethics Committee in Gothenburg

Author Keywords

phenotype, locomotor activity, multivariate analysis, PCA, PLS, rat, QC, standardization.

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