

Introduction

Noldus recently developed a new feature in EthoVision 3.0: Mobility detection. This parameter can be used to score the behavior of animals in the Porsolt Swim Test (PST) automatically. In ongoing research at Utrecht University, Saskia C. Berndsen and Laus M. Broersen tested this module and compared the results to data obtained by traditional hand scoring of the subjects from videotapes. In the experiment, the effects of chronic administration of either the tricyclic antidepressant Desipramine or its vehicle, Saline, on activity in the PST were evaluated.

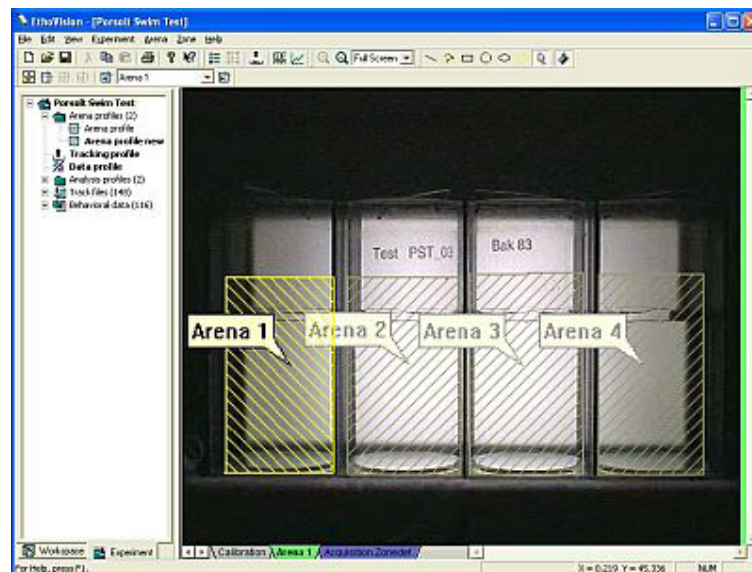


Figure 1. Screen of EthoVision of the defined arenas in the Porsolt Swim Test

Computer scores

In order to define the optimal settings for the mobility thresholds within EthoVision, the video recordings (MPEG-1 files) of 4 rats were studied. During data acquisition visual inspection was used to fine-tune the threshold settings in EthoVision to distinguish between immobility, mobility and strong mobility. The mean score resulting from this inspection was used as threshold setting during the entire experiment.

For the present experiment, the immobility threshold and the strong mobility thresholds were set at 11.5 and 17.0 % respectively. Using these settings, the activity of all rats in the PST was acquired automatically by EthoVision (see also figure 2).

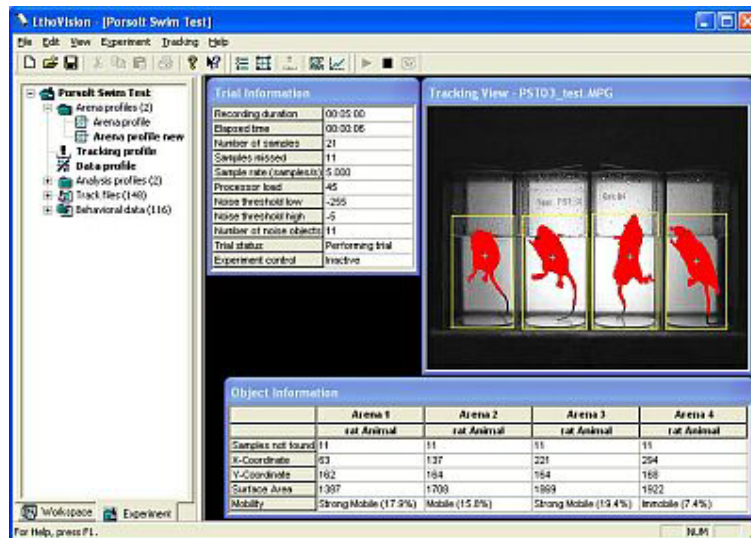


Figure 2. Data acquisition in EthoVision, with the real-time computed Mobility parameter as part of the Object Information window.

Furthermore a fixed averaging interval of 1 second was chosen to smooth the Mobility parameter. During each interval the total Mobility is summed over the number of samples specified, and divided by the number of samples, to create an average Mobility for these samples. This way, sudden changes in surface area caused by other factors are smoothed out.

Manual scores

In addition to the computer scored data, all rats in the experiment were also scored by hand, the traditional way. For this the Manual Event Recorder built into EthoVision to score individual behaviors was used. The experimenter distinguished inactivity, swimming and climbing; 3 mutually exclusive behavioral states.

Table 1. Comparison of behavioral states used in manual scores and computer scores

Manual score	Computer Score
Inactivity	Immobile
Swimming	Mobile
Climbing	Strong Mobile

Comparison of methods

Frequency scores of behaviors obtained by EthoVision were higher than those obtained by hand. This may be caused by the difference in time resolution between an automated system and the human eye. Therefore, we focused on the total duration of different behavioral states for analysis. The manually scored data and automatically obtained data for the three behavioral states were analyzed in EthoVision and then exported to SPSS (version 11.0.1) for further statistical analysis. A rough comparison of behavioral states was applied, linking immobility to inactivity, mobility to swimming behavior and strong mobility to climbing behavior, as indicated in table 1. In general, computer scored data showed a small bias towards active behavioral states, independent of treatment, but this did not interfere with a proper evaluation of drug effects in the PST. Although this bias is significant, it is identical for all animals and all treatments. It is unlikely to interfere with the detection of drug-induced behavioral changes.

Effects of Desipramine in the PST

Finally, a comparison was made between the results obtained with both scoring methods concerning the effects of the antidepressant Desipramine on activity in the PST. Desipramine is known to reduce inactivity in the PST and to increase climbing behavior. As can be seen in figure 3A, this effect of Desipramine was indeed observed in the present experiment when hand scores are evaluated. The same effect was observed in the data scored by computer, as shown in figure 3B. Independent of the scoring method, Desipramine decreased inactivity/immobility and increased climbing/strong mobility. Swimming/ mobility scores were unaffected by Desipramine.

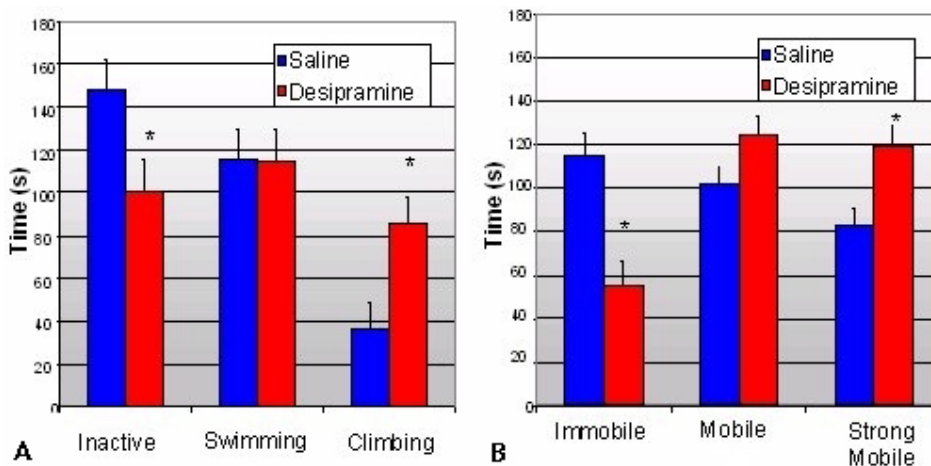


Figure 3. Data scored by hand (A) and by computer (B) for Saline (n=8) and Desipramine (n=6) in the PST.

Conclusions

- The Mobility parameter of EthoVision is well suited to analyze relevant behavioral changes in the PST induced by the antidepressant drug Desipramine.
- The Standard Error of the Mean of the data scored with EthoVision is smaller than the data scored by hand.
- Although the results obtained with the Mobility parameter do show a small bias towards active behavioral states, this does not interfere with a proper evaluation of drug effects in the PST.
- Future investigations should indicate whether the Mobility parameter of EthoVision is also suited for measuring the effects of SSRI-antidepressants, which are known to induce selective changes in swimming behavior in the PST.