

We routinely use object recognition to assess cognition in mice. Following familiarization trials with three objects (toy horse, monkey, man; Figure 1A), the mouse is tested in a novel location recognition test in which one of the familiar objects is moved to a novel location (Figure 1B) and in a novel object recognition test in which a novel object (cow) replaces one of the familiar objects (Figure 1C). ‘Exploration’ of objects is defined as approaching the object nose-first within 2 to 4 cm. As this test is relatively labor intensive,

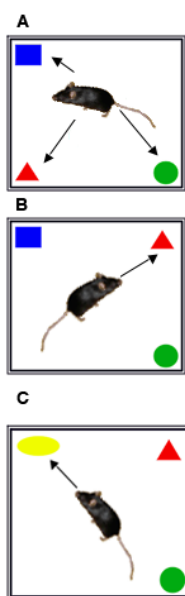


Figure 1. Object recognition test.

we started to explore whether EthoVision® XT’s multiple body point video tracking could be used to analyze object recognition data.

For EthoVision XT’s analysis, the arena was divided in object zones containing an object. The remaining area was defined as rest zone. Exploration was defined as nose in object zone (yellow point on mouse, Figure 2) and body center in rest zone (blue point on mouse, Figure 2).

EXPERIMENT 1

Object recognition data of fifteen mice were manually scored by a trained observer, analyzed using EthoVision XT, and correlations were assessed between scoring the percentage time spent exploring the four objects over trials 3 through 5. EthoVision XT’s percentage correlated with the manually scored percentage Time Spent Exploring the horse ($r = 0.660$, $p < 0.0001$), the monkey ($r = 0.419$, $p = 0.042$), and the cow ($r = 0.677$, $p < 0.0055$), but not the man ($r = 0.161$, $p = 0.2903$). The lack of correlation for the man was because the mouse could pass the object from behind, creating artifacts in the data. In subsequent experiments, this issue was successfully addressed by moving the man closer to

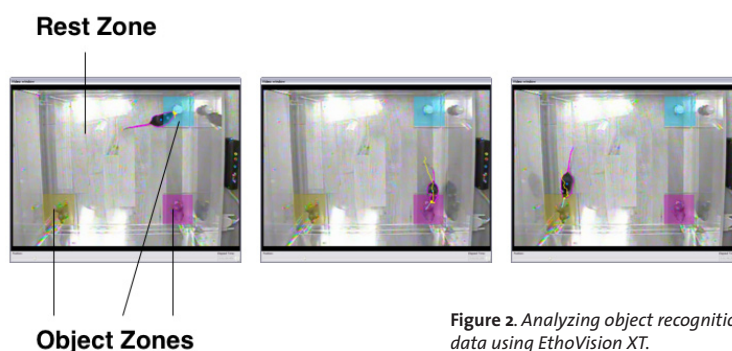


Figure 2. Analyzing object recognition data using EthoVision XT.

the corner of the arena. More exploration of the object in the novel location than the familiar location was scored by both EthoVision XT (old location: 32.2 ± 2.4 ; novel location: 44.4 ± 3.0 , $p = 0.0035$) and the observer (old location: 35.4 ± 1.8 ; novel location: 49.7 ± 2.6 , $p = 0.0001$). Similarly, more exploration of the novel object than the two familiar objects was scored by EthoVision XT (cow: 40.1 ± 3.7 ; man: 28.4 ± 3.4 ; monkey: 31.5 ± 2.1 , $p = 0.0032$) and the observer (cow: 45.2 ± 3.2 ; man: 27.3 ± 2.0 ; monkey: 27.6 ± 2.2 , $p < 0.0001$).

EXPERIMENT 2

We determined whether EthoVision XT could correctly determine exploration events in time using the criterion of nose point of the mouse within a zone encompassing ca. 3 cm space around each object while the body center point remained outside of the zone. Initial observations were made by looking for observed events in the recorded video files at the time-points that EthoVision XT determined exploration events. EthoVision XT-determined exploration events corresponded to actual exploration events in the video files. In current work, observers will blindly determine and time-stamp exploration events from the video files to be objectively compared to the number and temporal distribution of exploration events determined by EthoVision XT.

EXPERIMENT 3

Object recognition was live scored with EthoVision XT and manually scored by two trained observers from the recorded digital video. Initial analysis has shown that the magnitude order of exploration determined

for the three objects (e.g. man>monkey>horse) is the same between EthoVision XT and the manually scored data 80 to 90 percent of the time.

CONCLUSION

Thus, EthoVision XT is likely an excellent tool for automatically scoring percentage time exploring objects in object recognition tasks with mice. Current work determines correlations between EthoVision XT-scored exploration times and manually scored exploration times, and whether EthoVision XT shows the same pattern of group differences in exploration times that are determined by trained observers.

We thank all members of the Noldus team, and especially Ruud Tegelenbosch and Wil van Dommelen, for their continuous support for this project.

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