

Tracking Behaviour in a Large Number of Experimental Units

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Introduction

Recent technological advances have delivered a virtually endless range of observation tools operational in projects investigating the behaviour of animals. However, experimentalists are often one step ahead in regard to their demands, and it is sometimes difficult to find an appropriate solution for recording movements of focal animals, especially when finances are limited. Cutting-edge research in the study of animal behaviour sometimes requires a large number of video-cameras with rather special specifications. In a study on the quantitative genetic background of animal personality in tadpoles, we had to deploy a video-recording system consisting of 69 cameras, recording swimming behaviour in a total of 800 experimental containers. We describe difficulties of setting up and running such a system on limited resources, and provide simple solutions we found.

Methods

We had to position 800 tadpoles kept individually while allowing for recording all of them simultaneously. We used a rack-system with three levels above each other to save lab-space, and arranged tadpole-holding dishpans in groups of twelve to lower the number of cameras needed. We mounted video-cameras on the bottom-side of the shelf above. Recording movements of tadpoles this way, however, required cameras able to take recordings from close-up and exhibiting wide-angle-objectives. While USB-cameras are often a good solution in similar projects, they were not handy in this case because they require external recording and controlling units and we had to use a large number of video-cameras. Between recording-events we had to handle dozens of large video-files and download them relatively quickly, while not disturbing experimental animals too much and not moving the cameras' focus out of place. Consequently, we needed cameras with removable memory cards. We also had to keep costs per unit low and choose thin cameras not to lose precious distance between observed animals and the objective of the cameras. Consequently, handycam-type cameras, surveillance cameras and action-cameras could also not be used. One further challenge we faced was the synchronization of cameras: we had to switch all 69 cameras on and off at the same time and leave the experimental animals undisturbed.

Results and conclusions

We found that car cameras (also referred to as dashcams) fulfilled all requirements listed above. They record from close-up, exhibit wide-angle-objectives (typically 120°), they come with removable memory cards (which can be upgraded to up to 32 GB), are small in size (starting from ca. 3 cm thickness) and are relatively cheap (starting from ca. 40 € per unit). Furthermore, these cameras are easy to control since they automatically start recording when turned on and stop recording when turned off, making it easy to synchronize them by simply aggregating their supply cables into one single timer. Additionally, an in-built display facilitates aiming of this type of camera before recording. Using these cameras and the setup outlined above, we managed to record movements of 800 tadpoles simultaneously and obtained repeated (15 min × 6 recordings on 2 × 2 consecutive days) good-quality

recordings of groups of 12 individuals. We hope our paper will encourage peers to embark on similar projects they had recognized infeasible due to assumedly astronomical costs.

Ethical statement

This research adhered to the legal requirements of the country in which the work was carried out, and to all institutional guidelines. The Közép-Duna-Völgyi KTVF issued the permission to conduct the study (KTVF:10350-2/2012) and the Ethical Commission of the MTA ATK NÖVI approved the investigation in accordance with Good Scientific Practice guidelines and national legislation.