# Using cognitive bias as an indicator of welfare in laying hens: The development of a method

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## INTRODUCTION

Positive or negative emotions (affective states) constitute an important component of modern concept of animal welfare. The development of objective methods for assessing the affective states of non-human animals represents an essential step in improvement of animal welfare. Cognitive bias is a new method derived from similar phenomenon in humans developed to measure indirectly animal emotions. This type of tests is based on the findings that during negative affective states are accompanied by higher attention to threatening stimuli and an increased probability that ambiguous information will be interpreted pessimistically. On the other side positive affective states are accompanied by more optimistic judgements. According to this concept cognitive performance of animals reflecting their experience and quality of environment can be used for measuring their affective states.

## AIMS

- to develop the operant chamber for laying hens
- to optimize both training and testing of cognitive performance in hens

## SKINNER BOX

- operant chamber (80 x 60 x 60cm) equipped with:
  - ***touch-screen*** (ELO 1529L) – presentation of stimuli and data collection (pecking to stimulus)
  - ***automatic feeder*** – reward providing (mealworm) – using the modified CD-ROM stepper motor
  - ***speaker*** – punishment (unpleasant sound - white noise)
  - ***web camera*** – behavioural recording
  - ***I/O Warrior chip*** – I/O interface between the feeder, touch-screen and computer
- apparatus was managed by the functions of the Biopsychology Toolbox running under the Matlab


***Fig. 1*** ***The operant chamber.*** *(a) outside view; (b) inside view with opened automatic feeder after correct response to positive stimulus; (c) CD –ROM stepper motor controlling feeder*


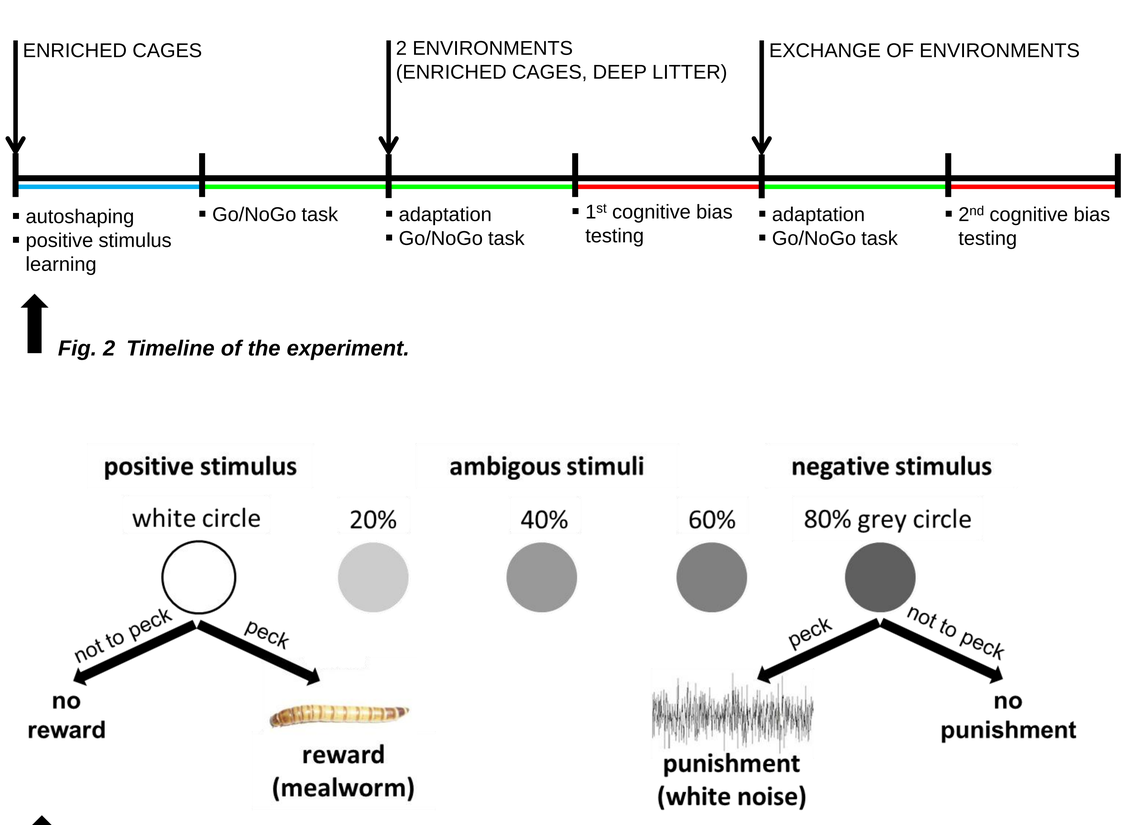


***Fig. 2*** ***Timeline of the experiment.***

## SCHEME OF EXPERIMENT

- *training period* - enriched cage (wire floor, dust bathing area, nest, perch)
  - autoshaping, positive stimulus learning, Go/NoGo task (Fig.3, 5)
- hens divided into 2 groups according to housing environments (enriched cage or deep litter box) → 1 week habituation with Go/NoGo testing
- *1st testing period* - 2 known and 3 new ambivalent stimuli (Fig. 4)
- exchange of environments → 1week habituation with Go/NoGo testing
- *2nd testing period* - 2 known and 3 new ambivalent stimuli




***Fig. 4*** ***Experimental paradigm of cognitive bias testing.*** *Birds were trained to react to positive stimulus (white circle in half animals and 80% grey circle in other half) rewarded by mealworm, and to refrain from pecking to negative stimulus (80% grey circle in one half of animals and white circle in other half) connected with punishment (white noise). Once the hens had acquired discrimination they were presented with 3 unreinforced ambiguous (20, 40, 60% grey) circles. Each of five stimulus types was exhibited twelve times in random order within one session.*

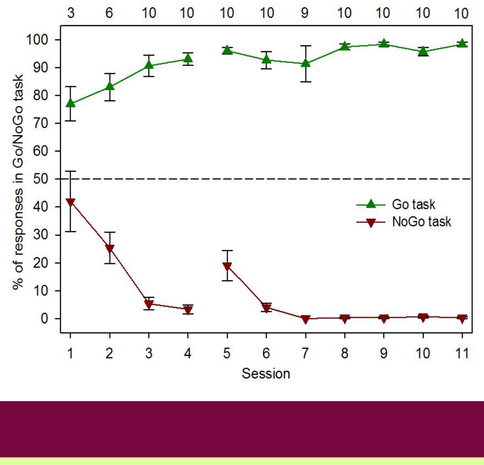


***Fig. 5*** ***Speed of learning in Go/NoGo task.*** *Between 4th and 5th session the training was interrupted for three weeks. The numbers on top of the graph represent the number of hens significantly discriminating stimuli (total number of hens n=10).*

***Fig. 3*** ***Example of a performance of hen in Go/NoGo task.*** *(a-c) performance during Go task. Correct response (pecking) and resulting reward by mealworm in the opened feeder; (d–f) performance during NoGo task. Correct response (refraining from pecking) to negative stimulus to avoid punishment (white noise). Thirty* positive and thirty negative stimuli were presented in random order within one session.

## Conclusions

- our first experience shows that this apparatus is suitable for measurement of cognitive bias as an indicator of laying hen emotions and welfare
- touch-screen operant chamber provides a flexible solution for the use with various behavioural paradigms (autoshaping, fixed ratio, fixed interval, Go/NoGo tasks)
- all laying hens significantly discriminated positive and negative stimuli after three Go/NoGo sessions

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