**Electronic supplementary material**

**Uninhibited chickens: ranging behavior impacts motor self-regulation in free-range broiler chickens (*Gallus gallus domesticus*)**

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1. **Material and methods**
   1. **Animal housing and husbandry**

Two hundred *naked neck* male broiler chickens (*Gallus gallus domesticus*), were reared from one-day-old in a free-range system, with a stocking density of ten individuals/m² in the poultry house (4 x 5 m) and 0.42/m² in the outdoor range (27 x 17.5 m). Temperature and luminosity were monitored up to 15 days of age and chickens had free access to the range from 36 days of age. At 28 days of age, 120 individuals were randomly selected and identified via a rectangular white plastic poncho around the neck, with unique acronyms for easy identification (see supplementary video). Chickens were inspected daily by the experimenters and/or animal caretakers, with occasional physical intervention as needed for the maintenance of the plastic ponchos. These animals had, therefore, the same amount of human contact.

* 1. **Ranging behavior**

A full description of the measurements of the chickens’ ranging behavior level is described in Ferreira et al. (2019). Briefly, we performed seven interspaced scans per day at six different ages (between 39 and 55 days of age), totaling 42 scans, in order to know the range location (inside the poultry house or zones A, B, C on the range) of identified individuals (chickens carrying a poncho). As different zones had different areas (A = 0 - 4.5m, B = 9 - 13.5m, C = 13.5 - 27m from the poultry house), we calculated an individual ranging distance index, considering a given chicken walked the equivalent of a half-length of this zone plus the total length of the already crossed zones, in the case of zones B and C.

**Ranging distance index** = number of times seen in zone A\*2.25 + number of times seen in zone B\*9 + number of times seen in zone C\*20.25

* 1. **Individual selection**

From a pool of 51 chickens available, we split individuals into percentiles based on the ranging distance index of all individuals to select chickens falling in the first quartile (low values, indicating low ranging behavior) and individuals falling in the third quartile (high values, indicating high ranging behavior), these individuals were considered as low ranger and high ranger chickens, respectively. Nineteen free-range male broiler chickens (*Gallus gallus domesticus*, naked neck) were selected (nine low ranger chickens [ranging distance index = 20.75 ± 4.46] and ten high ranger chickens [ranging distance index = 57.6 ± 14.47]) for subsequent tests.

1. **Motor self-regulation task**

In the mornings, before the start of each phase of the task, chickens were food-deprived for at least four hours before the beginning of the tests in order to standardize food motivation among individuals. This was to ensure all chickens had depleted their crop-stored food.

* 1. **Habituation**

To reduce and avoid the stress caused by social isolation and novelty in the chickens, before training and testing, the birds were habituated across 3 days, to the different components of the test arena, the devices (cylinders and transparency) and food rewards (superworms, *Zophobias Morio*).

On the first day of habituation, individuals were placed for 15 minutes in the arena, in groups of four. To motivate exploration behavior, the floor of the arena was covered with straw, standard food, and superworms. The opaque cylinder (no reward inside, l × d × h: 20 × 10 × 26 cm, Figure 1) was present in the center of the arena in order to familiarize the individuals with this device.

In order to get them used to being gradually isolated, for the second day, pairs of chickens were placed in the test arena for 10 minutes with straw and standard food and 5 superworms cut in half. For this day, a small transparent cylinder (different from the one used during testing was used, l × w × h: 30 × 5 × 22 cm, Figure 1) to familiarize individuals to transparency and possible side-effects of neophobia.

Individual habituation of each chicken occurred on the third day, where individuals had access to the arena for 10 minutes with the small transparent cylinder surrounded by five superworms.

* 1. **Training**

Each chicken was given 8 consecutive trials per day. The first trial of an individual was always a ‘warm-up’ trial, where it received, as a reminder, a trial of its last successful phase, independently of its actual phase. For phase 1, we placed two superworms on the ground near both ends of the cylinder, one in the center of the cylinder and two at its ends. For phase 2, we placed three superworms inside the cylinder, two at its ends and one in the center. Finally, for phase 3 a single superworm was placed at the center of the cylinder (Figure 1b).

When an individual failed a trial in a given phase (actual phase), it received a trial of its last successful phase (reminder trial), if this trial was successful it could then retake and continue trials of its actual phase, if it failed the reminder trial it went back to a trial in its penultimate successful phase. For example, an individual which succeeded phase 1 and 2 on the previous day, started its first trial of the day with a phase 2 trial, if it failed, it received a phase 1 trial, if it succeeded, it then received phase 3 trials.

During training, if the individual did not eat all the worms during three consecutive trials within two minutes, despite the efforts of the experimenter to motivate or direct the bird towards the reward (by gently touching or blocking movement away from the cylinder to facilitate access to the superworms), the trials were stopped for the day.

The individual was permanently eliminated from the task when it failed to pass each one of the three phases for 5 consecutive days. One low ranger individual did not pass phase 1 and three individuals (two high rangers and one low ranger) did not pass phase 2.

* 1. **Test**

For the test, the opaque cylinder was replaced by a transparent one and the individual could pass a maximum of 8 consecutive trials per day, with for the first trial being a reminder of phase 3 of training. Each trial lasted a maximum of one minute and had two different outcomes: in the first case, if the individual correctly detoured to the sides of the cylinder and ate the superworm, the trial was considered successful and was stopped immediately. If the individual pecked the transparent wall trying to reach the reward, the trial was considered incorrect but the individual was still allowed to find its way to the sides of the cylinder and eat the superworm up to one minute, if the bird still did not find the worm, the experimenter tried to motivate or direct the chicken to the reward for an additional minute. This was done to keep the chickens motivated to interact with the transparent cylinder even after multiple failures.

Individuals were submitted to test trials with the transparent cylinder until reaching ten active trials (with a correct or incorrect response). When the animal did not touch or interact with the cylinder, the trial was not counted (inactive trials). As per training, if the individual did not interact with the cylinder and did not eat the superworm during three consecutive trials, the trials were stopped and resumed the next day.