

SHORT COMMUNICATION

CAN 'ENVIRONMENTAL ENRICHMENT' AFFECT DOMESTIC CHICKENS' PREFERENCES FOR ONE HALF OF AN OTHERWISE SYMMETRICAL HOME CAGE?

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Final Acceptance: 19 November 1998

Abstract

Animal Welfare 1999, 8: 159-164

Chickens were reared in pairs in wooden boxes from 1 to 10 days of age. One chick from each pair was marked to facilitate identification and its position in one or other of the symmetrical halves of the home box was noted at each of 32 visual scans carried out every day. Cumulative sightings in each half were calculated across the first 5 days to establish the least preferred half. Three 'enrichment' objects were then placed in the least preferred half of each box on day 6. The chicks' positions were again recorded at each of 32 scans on 5 consecutive days. The enrichment objects were avoided on day 6 but such neophobia waned within 24h and a weak, non-significant trend for enrichment to increase usage of the least preferred half became apparent. The strong side preferences shown by the chicks before the introduction of enrichment stimuli, and their transitory neophobia, sound important cautionary notes for the design and assessment of husbandry and environmental enrichment procedures.

Keywords: *animal welfare, cage side preferences, domestic chicks, environmental enrichment*

Introduction

The common practice of housing intensively farmed chickens in barren, invariant surroundings can lead to increased fearfulness, cognitive impairment and the development of harmful behaviours, such as feather pecking, as well as to significant reductions in performance, product quality and profitability (Jones 1996; 1997). Environmental enrichment, which provides animals with a more stimulating and complex environment, is commonly promoted as a potential remedial measure (Mench 1994; Jones 1996). Indeed, incorporating putative enrichment stimuli in the home cages of chicks or laying hens has reduced fearfulness, injurious pecking and mortality; and improved growth, food conversion efficiency and egg production (Jones 1996).

Although it is arguable whether environmental enrichment, at least in its more traditional, experimental psychology sense, has been studied by some authors, many have examined chickens' preferences for different substrates. For example: adult hens were offered one putative enrichment stimulus (wood shavings) for a brief period in a test environment

outwith the home cage (Dawkins 1981); egg laying was examined when hens were given a choice between artificial turf or a wire floor (Hughes 1993); and chickens' preferences for nest boxes containing varying amounts of wood litter were studied (Petherick *et al* 1993). Each of these studies focused on changing just one aspect of the substrate. However, a greater choice of stimuli were presented during assessments of the relative attractiveness of feathers, straw, wood shavings and sand as substrates for pecking, scratching and dustbathing for young chicks (Sanotra *et al* 1995); and of the peck-eliciting properties of differently coloured bunches of string for adult laying hens (Jones & Carmichael 1998). However, to the best of our knowledge, it has not yet been established whether chickens actually 'prefer' an environment enriched with a variety of conspicuous, artificial objects to a non-enriched one.

The present study addressed the latter issue. Despite the controversy over the value of preference tests (Hughes 1977; Duncan 1978; Bayne *et al* 1991; Fraser & Matthews 1997), they do allow for some determination of what an animal finds attractive. For example, 'if the various stimuli are equally healthful (or neutral), the observer may be able to draw conclusions about those stimuli to which the animal prefers being exposed' (Bayne *et al* 1991). Furthermore, rather than simply offering the birds a straightforward choice between an enriched or non-enriched environment, we adopted a much more critical approach in the present study by asking if enrichment could alter previously formed environmental preferences. Thus, as a prerequisite, we determined if pair-housed chicks would establish preferences over a number of days for one or other of the symmetrical halves (right and left) of their home cage. We then asked if we could affect the observed preferences by enriching the least preferred half.

Materials and methods

Thirty-two, female, ISA Brown chickens (a medium-hybrid line derived from a Rhode Island Red x Rhode Island White cross) were obtained from a commercial supplier at 1 day of age and housed in 16 pairs in wooden boxes measuring 72x38x30 cm (length x width x depth). One of each pair was marked on the back of the head with indelible ink to facilitate identification. The home cages rested on 1m-high shelves and their 1cm wire-mesh floors allowed the passage of excreta. Overhead fluorescent strip lights provided even illumination within the boxes, from 0500h to 1900h each day, and a dull emitter heater suspended above each box maintained an ambient temperature of approximately 29°C in both sides. Each half of the box contained two identical food-hoppers, one providing *ad libitum* food (chick starter mash, produced at the Roslin Institute) and the other water. These were suspended from similar locations at the top of each end wall and could be removed and replaced remotely for maintenance. They were replenished twice a day between 0900h to 0915h and 1615h to 1630h.

As far as we could tell, the internal environments in both halves of each box were the same. Apart from the door, which the chicks could not see, there were no features in the room which might otherwise have provided external, positional cues.

The chicks remained undisturbed until testing began at 0930h on the day after arrival. At testing, each box was divided in half by an imaginary line. Thirty-two visual scans were then

performed on each box at intervals of 10min on each of 5 consecutive days, (16 scans in each of the periods between 0930h to 1200h and 1330h to 1600h). At each scan we recorded the position, ie in one box half or the other, of the marked bird. A chick was deemed to be in that half of the box which contained the major part of its body. (Both members of a pair generally stay close to each other.) After 5 days, the cumulative sightings were calculated in order to establish which was the least preferred half of each box, ie the one in which the birds were observed least frequently. At 0900h on day 6, three enrichment objects were placed in the least preferred halves and the scanning procedure described above was repeated on that day and the four following days. The 'enrichment' stimuli consisted of: one white table tennis ball painted with 60 spots of blue, red and green inks; one 4cm piece of orange rubber tubing; and one bunch of 4cm white strings tied together at one end. Each item was suspended with clear nylon fishing line from the top of the wall so that it was 2.5cm above the floor and could swing freely if pecked, pushed or pulled. The stimuli remained in place until the experiment was terminated on day 10.

Statistical analysis

The null hypothesis that the chicks would show no preferences over the first 5 days, ie that they would be sighted 80 times in both halves, was examined in each of the 16 boxes using a one-tailed Binomial test. Cumulative means of the sightings recorded in the least preferred half (across days and boxes) were then compared before and after enrichment (days 1–5 vs days 6–10; days 1–5 vs days 7–10; and days 2–5 vs days 6–10) using the Wilcoxon signed ranks test. This test was also used to compare sightings on day 5 vs day 6, day 5 vs day 7 and day 5 vs day 10. These sets of data points were chosen for comparison on a post hoc basis, because the marked avoidance of the enrichment stimuli apparent on day 6 may have biased the cumulative post-enrichment sighting scores for days 6–10.

Results

The chicks showed strong preferences (Figure 1) for one of the symmetrical halves of their home boxes over the 5 days before the enrichment stimuli were incorporated ($z = 2.53$, $P < 0.006$). All 16 marked chicks showed such dichotomies and 9 of these individual preferences were significant (all $P < 0.05$). Although it was not visible to the chicks, the door was the only discrepant feature which might have provided a positional cue in the home room – but there was no evidence that the side preferences were sensitive to this.

Comparisons (days 1–5 vs days 6–10, $T = 62.0$, $P = 0.78$; days 1–5 vs days 7–10, $T = 46.0$, $P = 0.27$; and days 2–5 vs days 6–10, $T = 49.0$, $P = 0.34$) of cumulative sightings in the least preferred sides revealed no significant effects of enrichment. However, incorporating the enrichment objects on day 6 caused significant avoidance and thereby exaggerated the previously established side preferences ($T = 96.5$, $P < 0.04$). The similar numbers of sightings recorded on days 5 and 7 ($T = 65.0$, $P = 0.80$) revealed that fear and avoidance of the enrichment stimuli had waned after 24h. A numerical but non-significant ($T = 38.5$, $P = 0.13$) trend for enrichment to increase usage (mean \pm SEM sightings) of the least preferred side was apparent when we compared sightings on day 5 (12.62 ± 1.50 sightings) with those on day 10 (14.75 ± 1.28 sightings). Of our 16 chicks, 3 showed a significant ($P < 0.05$) shift in preference to the enriched half.

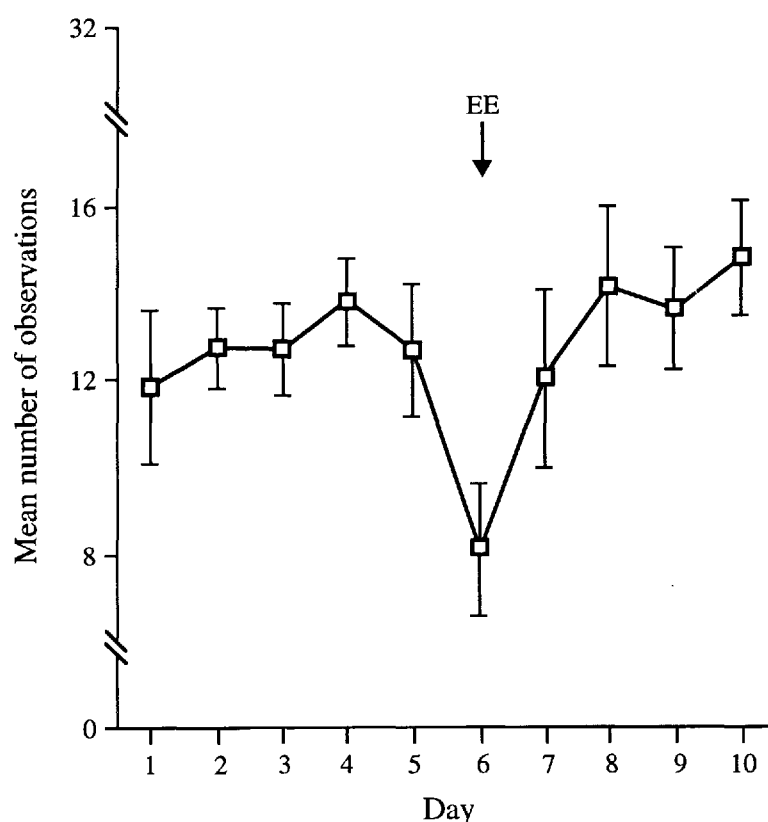


Figure 1 Sightings (mean \pm SEM) in the least preferred side of the home box for each of the 5 days before, and after, enrichment (EE) on day 6.

Discussion

Both halves of each home box appeared symmetrical to our eyes over the 5 days before enrichment stimuli were introduced into one side. Despite this, a significant preference for one or other of the halves was shown by the marked chick in 9 of the 16 boxes; and the remaining test birds also exhibited numerical preferences. Similar preferences for one side of a symmetrical cage over the other have been reported in laboratory rats (Calcagnetti & Schechter 1992) and rhesus monkeys, *Macaca mulatta*, (Bayne *et al* 1991). Collectively, these reports sound important cautionary notes. The existence of unknown side preferences could confound laboratory studies of environmental enrichment, space or resource usage, as well as general environmental choices. It could also have profound practical implications, because if all chicks in a flock exhibited the same preference, either directly or indirectly via social attraction, this could lead to an unbalanced use of the environment.

Novelty is a potent fear elicitor and new stimuli are generally avoided by all animals, at least initially (Jones 1987; 1996). This phenomenon probably accounts for the chicks' avoidance of that half of the home box containing the enrichment objects when they were first introduced on day 6. However, the absence of significant differences between sightings on days 5 and 7, ie before and after enrichment, clearly demonstrated that such neophobia

had waned within 24h. Moreover, there was a weak trend towards increased use of the previously least preferred side after the enrichment stimuli had been in place for 4 days.

Like rhesus macaques (Bayne *et al* 1991), only 25 per cent of our chicks shifted their preferences to the enriched half. This might reflect the fact that: i) chicks may not prefer enriched environments; ii) our enrichment stimuli may not have been sufficiently attractive to alter previously established preferences; iii) the timing of enrichment may be critical; or iv) a longer period of enrichment may have been required; indeed adult hens responded only gradually to a complex environment (Gao *et al* 1994). We must also remember that although increased usage of the enriched half failed to reach significance, this tendency may yet have reflected a positive choice (Duncan 1978). Furthermore, the enrichment stimuli might still have helped to satisfy a need for stimulation or at least provided additional opportunities for the chicks to engage in the important activity of information gathering (Mench 1994; Jones 1996).

Animal welfare implications

The attractiveness of putative enrichment stimuli is often assessed by recording how animals partition their time between an enriched and a non-enriched environment. Here, domestic chicks showed clear preferences for one or other of the seemingly symmetrical halves of their home cages over the 5 days before enrichment stimuli were introduced into the least preferred halves. Enrichment then elicited brief avoidance, before a weak, non-significant trend towards increased usage of the enriched halves became apparent. The former finding sounds a particularly important cautionary note. All field and laboratory studies of animals' choices should control for the possible existence of previously established environmental preferences. The design and assessment of enrichment and husbandry procedures should also take into account the transitory neophobia likely to accompany the introduction of unfamiliar resources.

Acknowledgements

This study formed part of a commission from the UK Ministry of Agriculture, Fisheries and Food. The Roslin Institute is supported by the Biotechnology and Biological Sciences Research Council.

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