

Modifying handling environments to improve welfare in farmed red deer (*Cervus elaphus*)

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To improve the welfare of farmed red deer (*Cervus elaphus*), two methods of modifying the physical handling environment were evaluated. Firstly, light versus dark conditions were examined by comparing activities of eight groups of 10 yearling hinds confined for seven minutes in an unfamiliar 4x6m pen which was well lit (200 lux) or dark (0 lux). In the dark, the deer were more dispersed and the frequency of exploratory behaviour (nosing and stepping) was greater ($P < 0.001$) compared with in the light. In a second experiment 24 yearling stags were each held in restraint in a deer crush for two minutes under light (1500 lux) or dark (0 lux) conditions. Heart rate was initially lower in the dark compared with the light (75.4bpm compared with 84.8bpm s.e.d.=2.73bpm). Thirdly, positional preferences of groups of three yearling stags in an unfamiliar (4x6m) pen were measured, when lighting (1000 lux) was provided on the left- or right-hand side of the pen. When the lights were on the left, the groups were displaced towards the right (x -coordinate=0.53), but were near the middle when the lights were on the right (x -coordinate=0.04, s.e.d.=0.156). Thus dark conditions were associated with more dispersion and exploration, lower heart rates, and positional preferences, indicating that welfare was improved by providing darkness.

A second method of modifying the handling environment was to provide large (5x4m) compared with small (2.5x4m) yard pens. Four groups of 10 two-year-old stags were confined at each pen size in early spring and mid-summer. Compared with summer, standing head butts were more frequent in spring (5.1 versus 0.14 (s.e.d.=0.59) butts/minute) as were moving head butts (3.6 versus 0.01 (s.e.d.=0.39) butts/minute), and bites were less frequent in spring (0.10 compared with 0.73, s.e.d.=0.174 bites/minute). In spring, aggression and stepping activity were more frequent in large compared with small pens, whereas in summer, this trend was reversed ($P < 0.05$). Therefore to minimise aggression and activity, small pens were indicated in spring and large pens were indicated in summer. However in both seasons deer might prefer large pens, as wall pacing and stereotyped head movements at the walls were more prevalent in small pens ($P < 0.05$), and greater individual distances were maintained in large pens ($P < 0.01$).

In conclusion, results indicated that both lighting and pen size affect the welfare of deer during handling, with dark conditions being more favourable than light conditions and large yard pens being more favourable than small pens in summer.