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Preference by Sows for a Partially Enclosed Farrowing Crate

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ABSTRACT

A preference testing apparatus was designed to give sows continuous access to three farrowing crates with different degrees of visual enclosure. A ‘fully enclosed' crate had solid black panels on the sides and top of the crate, a ‘solid-sided’ crate had the side panels only and an ‘open crate’ had no solid panels over the crate's tubular framework. The crates radiated from a central area sufficient for sows to enter or leave any crate freely. Video recording was used to determine sow position from 3 days before to 6 days after farrowing. The results indicated that younger sows (second or third panty) preferred the enclosure offered by the solid side panels during and for several days after farrowing ($P < 0.05$). Older sows, which had previously farrowed a number of times in an open crate, had no clear preference. A solid panel overhead did not improve, and may have reduced, the acceptance of a crate with solid sides. It is concluded that less experienced sows prefer a degree of enclosure on the sides of the farrowing crate, but that this preference largely disappears with repeated experience of open crates.

INTRODUCTION

Farrowing crates have come into wide use in pig production as a means of restraining the sow during farrowing and early lactation, and thus reducing accidental crushing of piglets. Nonetheless, the design features used in crates have been the subject of very little published research (Fraser, 1990) and the close confinement commonly seen in current designs has been questioned both from humane (Fox, 1984) and animal production viewpoints (Baxter and Petherick, 1980; Baxter, 1984).

Environmental preference testing – that is, providing animals with different environments and allowing them to choose – is one avenue for bringing designs into line with the animals' preferences. Despite acknowledged limitations (e.g. Duncan, 1978), the technique remains a useful means of identifying design features relevant to the animals (Fraser, 1988). In light of this a preference study was initiated to identify ways in which conventional farrowing crates could be modified to include features preferred by sows. As unrestrained sows spend much time and energy choosing and modifying a site for farrowing, usually with some degree of visual enclosure (Stolba and Wood-Gush, 1984; Jensen et al., 1987), we began our own work with a farrowing preference study in which sows were allowed to choose among crates enclosed to different degrees.

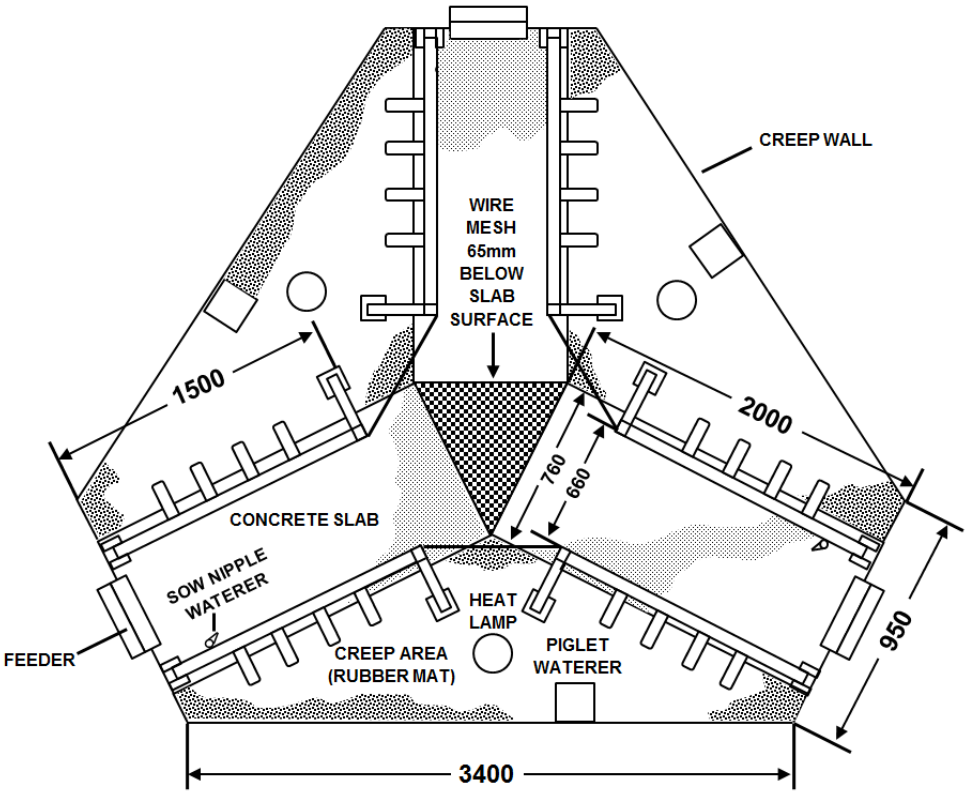
ANIMALS, MATERIALS AND METHODS

Test apparatus

A test apparatus was designed to offer individual sows free access to three identical farrowing crates which could be altered to test the animals' preferences for various design features. The three crates, each 1.5 m long by 0.7 m wide, radiated from a central 'hub' area sufficiently large to allow sows to exit from each crate and move freely into another (Fig. 1). Each crate consisted of two side assemblies open at the rear or 'hub' end, with a feeder and nipple waterer at the opposite front end. Each side consisted of four horizontal steel pipes of 45 mm outside diameter 37, 55, 75, and 95 cm above the floor, welded to 35-mm square support posts at both ends. Fastened to the bot tom horizontal pipe, about 27 cm apart, were four prongs pointing down and away from the sow area. The rear vertical support post was also angled outwards below the bottom horizontal pipe to form, in effect, a fifth prong which extended to the floor. Panels of expanded metal were hung between the rear support posts of the adjacent crates to enclose the central hub area.

The crates were mounted on a platform 30 cm above the floor of the room, each on a rectangular concrete slab (0.8 m × 2 m). Between these slabs were approximately triangular piglet creep areas covered in 15-mm-thick rubber mat (Fig. 1). At the hub, where the three concrete sections met, was a small triangular dunging area of wire mesh floor recessed about 65 mm below the concrete to discourage resting in this central area. Heat lamps and piglet water dispensers were provided in each of the three creep areas and plywood panels, 40 cm high, were mounted along the platform perimeter. Piglets had free access to any area on the platform. The test apparatus was located in a temperature-controlled room (24-28°C) at the Animal Research Centre's minimum-disease facility at Ottawa.

Fig. 1. Preference testing apparatus with three crates (plan view).



Treatments and experimental design

Experiment 1 compared crates with three degrees of enclosure, created by covering the tubular framework of the crates with rectangular black plywood panels. The 3 treatments were as follows: (1) a 'fully enclosed' crate with 1.5 m × 0.58 m panels covering both sides of the crate between the top and bottom horizontal bar and a 1.5 m × 0.66 m panel forming a roof covering the crate top; (2) a 'solid-sided' crate with panels on the crates sides but open at the top; (3) an 'open' crate with no solid panels over the crate's tubular frame work.

The experiment used 18 sows ranging from second to ninth parity, with a respective distribution as follows: 4,6,2,3,1,1,0,1. The selections were intended to represent a range of experience and were governed by the availability of sows at the start of each trial. Hence previous farrowing experience, all of which had occurred in tubular steel crates similar to the 'open' treatment, varied from one to eight times per sow. No first-parity animals were used because they were less accustomed to confinement and might have attempted to escape from the apparatus. Six 3 × 3 Latin squares were used to ensure that each treatment was offered an equal number of times in each of the three crates in order to balance any possible effect of position within the room.

Experiment 2 provided a more rigorous test of any preference young sows might have for the solid-sided option ahead of the open crates. In this exper-iment, two of the crates were open and one was solid-sided. The experiment used six sows of second or third parity (one or two previous farrowings in crates similar to the 'open' treatment). The solid-sided treatment was provided in each position an equal number of times.

Animals and procedures

Yorkshire and Yorkshire × Land race sows from the minimum-disease herd were placed in the crate about 5 days before farrowing was due and were removed 7 days after farrowing. Their daily ration (3 kg day^{-1} before farrowing, to appetite after) was divided equally among the three feeders to ensure that sows visited all crates each day. The testing apparatus was thoroughly washed with a pressure washer between each sow. Sows were used only once in the study.

The sows' use of the crates was monitored by time-lapse video recording with a single, wall-mounted camera and wide-angle lens. One frame was recorded every 5 min throughout the experiment. On subsequent analysis of the recordings, an observer noted which crate the sow was in its orientation in the crate (facing frontward or rearward) and its posture (standing, sitting, or lying). Results were expressed in 72-h periods based on the hour during which farrowing occurred: the 72-h period before farrowing (Days –3 to –1) and two 72-h periods after farrowing (Days 1-3 and Days 4-6). The behavior records were summed over the 864 observations per 72-h period.

Statistical analysis

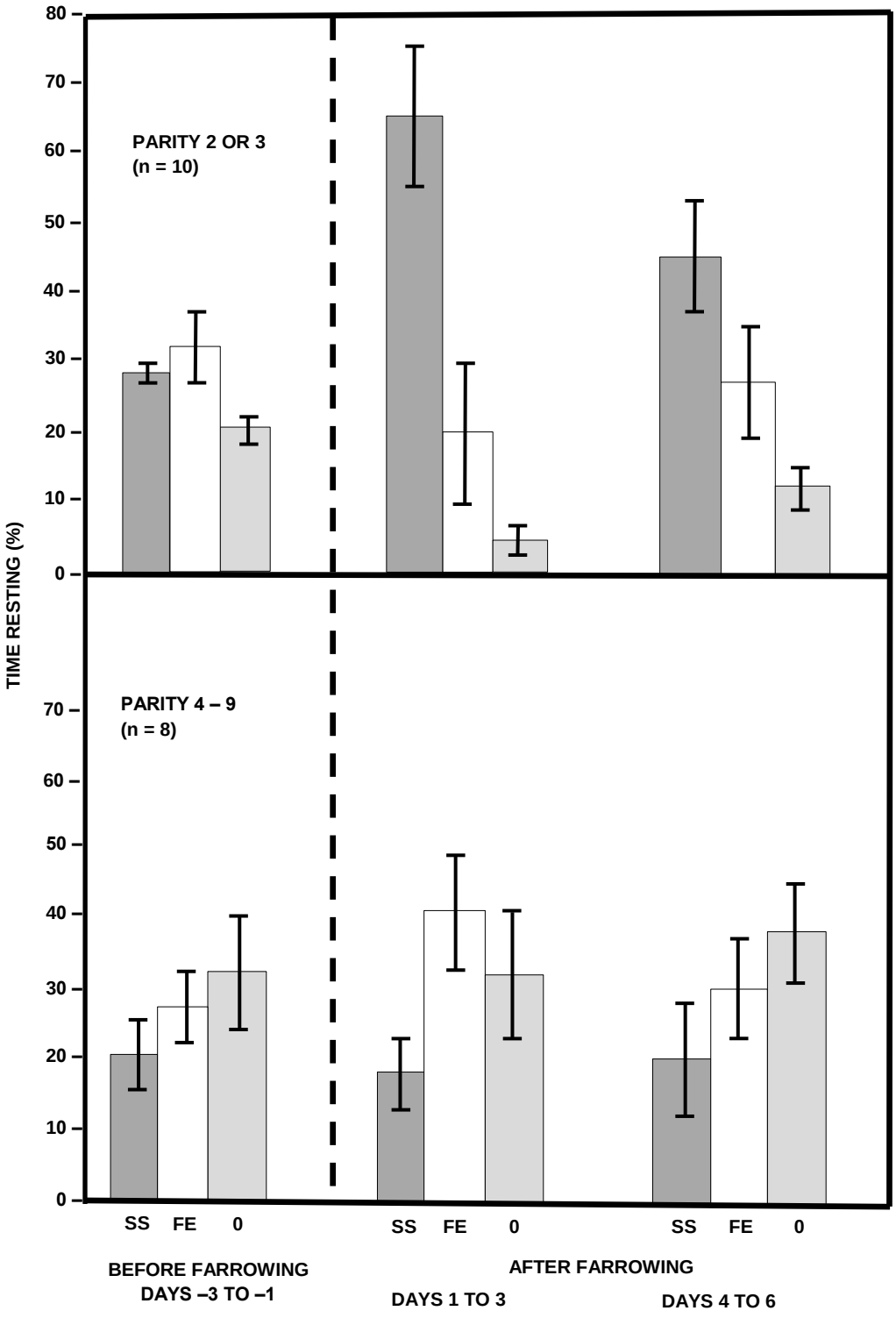
Preliminary analyses based on percentages from Experiment 1 showed little evidence of any effect of position in the room. Because of difficulties with the distribution of the percentages, it was decided to use non-parametric tests throughout, even though these methods ignore the possibility of position effects.

RESULTS

The analysis was based on the sows' resting behaviour because it accounted for about 88% of the sows' time. Sitting accounted for less than 3% of the time and standing (9%) was fairly equally divided among

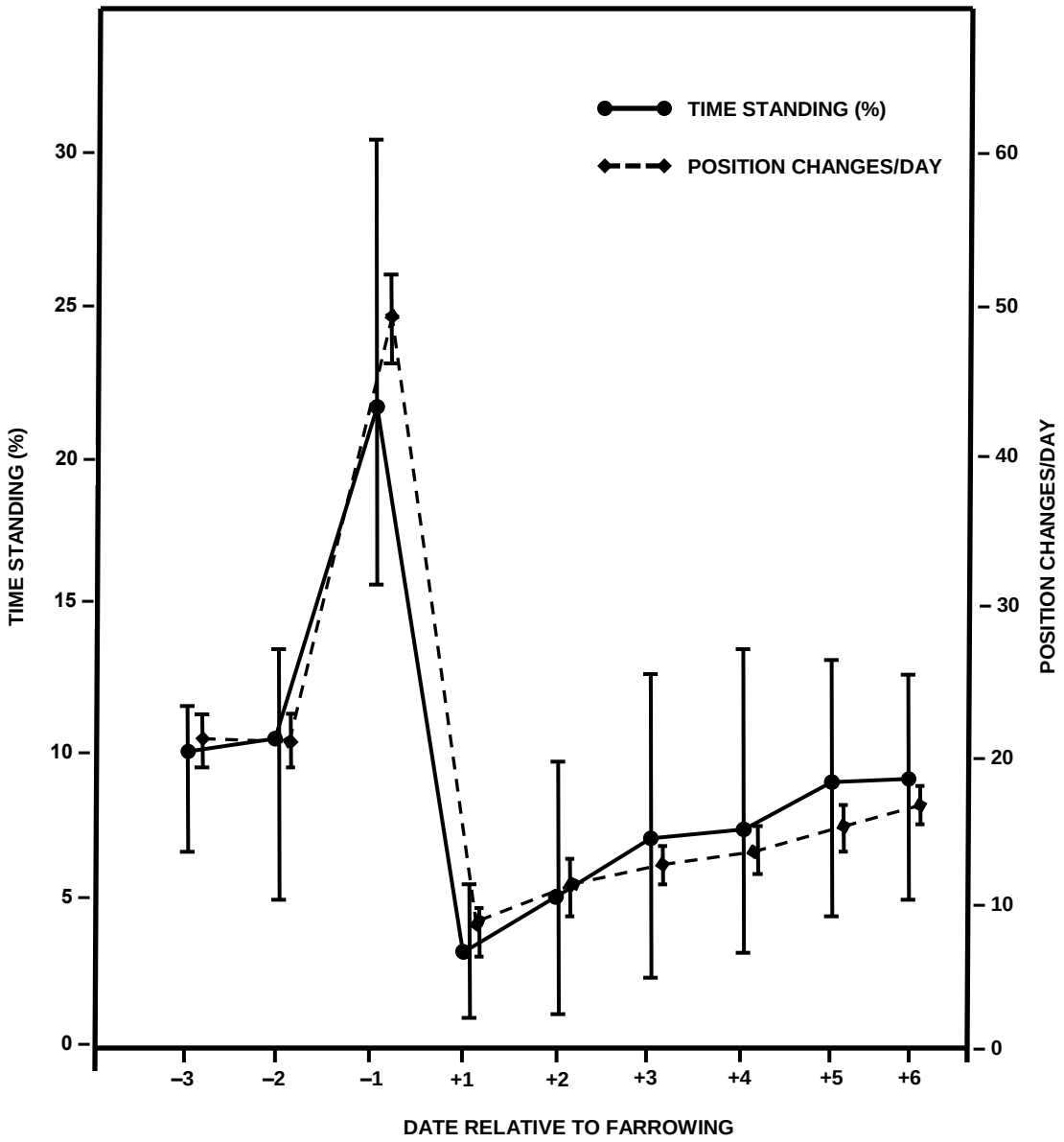
the crates, presumably because the feed was equally dispensed to each crate. Sows tended to eat less immediately after farrowing and percent time resting increased to about 95%.

Fig. 2. Mean (± SEM) time spent resting in each of the farrowing crates, expressed as percentage of time on test, for three time periods during Experiment 1. Two groups have been formed younger sows (of second and third parity) and older sows (fourth to ninth parity). SS, solid-sided; FE, fully enclosed; O, open crate.



After completion of Experiment 1, a clear difference in behaviour between the younger (second or third parity) and older (fourth to ninth parity) sows was evident. The Mann-Whitney *U*-test (Siegel, 1956), applied to the percent time spent resting in the open farrowing crate, showed significant differences between these two groups in both Days 1-3 and Days 4-6 after farrowing ($P < 0.05$).

Fig. 3. Mean percentage of time spent standing by the sows each day during Experiment 1 (the bars represent the range of percentages among sows after the two largest and two largest have been removed), and the mean (± SEM) number of position changes per day.



The second- and third-parity sows showed clear preferences for a farrowing crate with sides during Days 1-3 after farrowing (Fig. 2), with the solid-sided crate attracting the most time and the open crate the least. Friedman's rank test indicated a significant ($P < 0.05$) difference among crates in resting time during this period. The pattern was similar during Days 4-6 (Fig. 2) but the difference was not significant ($P > 0.05$).

Older sows, on the other hand, showed no clear preference for farrowing crate type at any time during the experimental period.

TABLE 1. Percentage of time spent by the six 'younger' sows in the one solid-sided and the two open crates (Experiment 2)

Sow	Pre-farrowing[1]		Post-farrowing[1]	
	Open[2]	Solid-Sided	Open[2]	Solid-Sided
1	79.9	20.1	46.4	53.6
2	51.4	48.6	7.5	92.5
3	44.7	55.3	0.2	99.8
4	27.8	72.7	30.2	69.8
5	94.1	5.9	97.9	2.1
6	28.4	71.6	1.1	98.9
Overall	55.9	44.1	22.2	77.8

[1] The pre-farrowing period included the 3 days before farrowing; the post-farrowing period included the 6 days after farrowing.

[2] The values for the open farrowing crate are based on the sum of the times for the two available open crates.

There was considerable variation in crate preference, even with the younger sows. One third-parity sow, for example, spent less than 2% of her time resting in the solid-sided crate during Days 1-3, even though other second- and third-parity sows spent over 90% of their time resting in crates of the same type.

The sows showed clear changes in activity level around the time of farrowing. The percentage of time spent standing increased dramatically the day before farrowing and fell to its lowest level on the day after farrowing (Fig. 3). Sows also changed position (i.e. moved from one crate to another or changed orientation within a crate) far more often on the day before farrowing than at any other time (Fig. 3). After farrowing, activity increased steadily until pre-farrowing levels were almost reached in about 5 or 6 days. The level of activity varied greatly among sows; one spent over 20% of her time standing on Days –3 and –2 and 45% on Day –1, whereas another spent only about 5% and 11% of her time standing during the same time periods.

In Experiment 2, which used only younger sows, five of the six sows spent more time after farrowing in the solid-sided crate than in either of the two open crates. The probability of at least five sows choosing this crate by chance is less than 2%. Three of the sows spent well over 90% of their time in the solid-sided crate (Table 1). The sixth sow showed a clear preference for the open crates before farrowing (Table 1) and continued this preference after farrowing.

DISCUSSION

Although the younger sows in Experiment 1 showed a clear discrimination among crate types, this finding emerged from the analysis of the results, not from the experimental design which mixed younger and older sows. The results also indicated that the attachment of a panel to the top of the crate to form a roof did not increase, and may have reduced, the acceptance of the fully enclosed crate. In Experiment 2, sows spent more time in the one crate with solid side panels than in the two open crates combined, clearly showing the attractiveness of this option to younger sows.

As the differential use of the crates was apparent on the few days after farrowing but not before, it presumably reflects an environmental preference specific to farrowing and early lactation, not a more

general preference of sows for partly enclosed environments. Jensen (1989) found sows outdoors chose more protected sites and built more substantial nests in winter, and Stolba and Wood-Gush (1984) found that sows in a semi-natural environment choose partially but not fully enclosed nest sites for farrowing. Hunt and Petchey (1989) found that sows preferred to farrow in areas with three or four sides enclosed compared to sites enclosed by only one or two sides (a roofed option was not studied). The higher levels of locomotion and frequent moves from one crate to another during the day before farrowing likely reflect the sow's tendency to search actively for a nest site and to enter repeatedly potential nest sites on the day before farrowing, as described by Jensen et al. (1987).

One weakness of environmental preference testing, as used in these experiments, is that the strength of the animals' motivation for the preferred option remains unknown (Duncan, 1978). In the present case, the sows' preference for solid side panels was not seen in those sows that had farrowed several times in open crates and was not shown by every sow even in earlier parities. These findings suggest that the preference for solid sides is not particularly dominant. While the use of solid sides should make the crates more hospitable for young sows, other design factors will presumably need to be examined to make a major difference in acceptability.

The cost of adding a solid-sided feature to crate construction should be minimal and the effect on the retail cost insignificant. Two options are available, one where solid panels would be a permanent part of each manufactured crate or, alternatively, where removable panels could be attached to crates near the lime of farrowing and removed when the Jitter was 1 week or so of age. Further field trials are needed to establish any operational or management problems which might be associated with the use of solid panel sides but none were evident in this study.

The design of improved farrowing environments should be viewed from an economic as well as an animal welfare viewpoint. Stress during farrowing is thought to contribute to production problems as hormones released during stress can interfere with the action of reproductive hormones (see Hansen and Curtis, 1981) and may contribute to prolonged farrowings, increased stillbirth rate (Baxter and Petherick, 1980) and perhaps to aggressive reactions of sows to their newborns (Fraser, 1990). Provision of a preferred farrowing environment might reduce some of these problems.

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