SHORT COMMUNICATION

ALLOWING CAPTIVE MARMOSETS TO CHOOSE THE SIZE AND POSITION OF THEIR NEST BOX

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Abstract *Animal Welfare 1999, 8:* 281-285

Preferences for nest box size and position were tested in two groups of common marmoset, Callithrix jacchus jacchus. *In a pre-test phase two, new, wooden nest boxes were introduced to each group alongside their old metal one, so that the animals could become familiar with them, and so that any pre-existing preference could be identified. In successive experiments: i) the old metal nest box was closed so that the marmosets had to choose a preferred box from the two new nest boxes; ii) the size of the preferred nest box was systematically reduced; and iii) in one of the groups the reduced nest box was restored to full size, but its position interchanged with the non-preferred box. In a further experiment, the position of the preferred, and then of the non-preferred box was raised to the highest point in the cage. The marmosets showed strong positional preferences which could not have been predicted without performing the tests. One of the groups also showed a strong preference for the high nest box. It was concluded that marmosets may exhibit preferences for their cage furniture, the basis of which may not be clear to us. These preferences should, however, be taken into account when designing cages to maximize the welfare of the animals.*

Keywords: *animal welfare, marmosets, nest box, preferences*

Introduction

What sorts of cages would marmosets design for themselves? Where would they put the cage furniture, the nest box, the platforms, the walkways and swings? In most laboratories where primates are kept, their keepers attempt to provide them with cages which satisfy their physical needs at the very least, and hopefully their psychological welfare as well. However, captive environments may reflect what we *think* the animal will like rather than what it actually *does* like.

One way of determining what an animal likes is to conduct a simple preference test, in which the subject is allowed a free choice of two or more simultaneously presented alternatives. Most welfare-related choice experiments have been performed with farm animals and poultry, such as hens (Hughes & Black 1973; Dawkins 1976). The technique could, however, also be useful for determining the preferences of laboratory-housed wild animals.

In the experiments reported in this study, common marmosets, *Callithrix jacchus jacchus*, were offered a choice between two otherwise identical nest boxes which differed in their size and position in the cage. Because marmosets are arboreal (Sussman & Kinzey 1984), we

predicted that they would prefer the highest-placed nest box which was offered. However, it was difficult to predict whether there would be a positional preference, and if so what it would be. Previous studies on callitrichids have suggested that individual preferences in substrate use do occur (Dolins & Chamove 1987), so we predicted that there would be preferences – but not their direction.

Methods

Subjects and housing

The subjects were two groups of common marmosets, housed in separate cages in separate indoor rooms. Group 1 consisted of a mother, her two adult sons and one adult daughter – and was therefore atypical for this species, there being no male-female pair. Group 2 was larger, comprising a breeding pair, their two adult sons and two adult daughters. Group 1 occupied two metal-framed wire mesh cages (approximately 1.5x4x2.5 m and 2x2x1.5 m) connected by flexible plastic tubing. Group 2 occupied a wooden-framed wire mesh cage (approximately 2x3x2.5 m). Both cages were fitted with various branches, platforms and hanging screens. The arrangement of the cage fittings, and the orientation and position of the cages in the two rooms, were identical. The animals were fed on commercial monkey pellets (Mazuri® New World Primate Feed; Special Diet Services, Witham, Essex, UK) in the morning and chopped fresh fruit in the afternoon. Water bottles provided tap water *ad libitum*.

Procedure and statistical analysis

The experiments took place over a period of 14 weeks between December 1991 and February 1992. During each (5-day) experiment, the entire cage was videotaped daily with a Panasonic M7 colour video camera in the absence of an observer for a 3h period at dusk. Videotapes were transcribed to yield data from the experiments which were then analysed by two-tailed *t*-tests and Binomial tests. The significance level was set at $P < 0.05$.

Experiment 1

The new, wooden nest boxes (34.3x15.2x14 cm) were introduced into the cages: one on the left adjacent to and at the same height (1.5m) as the old metal nest box (also 34.3x15.2x14 cm), the other on the right hand side of the cage at the same height and orientation. Thus, the marmosets had the choice of three nest boxes. The new nest boxes had a movable internal partition which could be used to systematically reduce the interior volume available for the animals. Data (the number of animals in contact with and number of animals inside the nest box) were collected by scan sampling at 30s intervals for four, 30min observation sessions on each of 5 days. This experiment offered the marmosets an opportunity to explore and become familiar with the new nest boxes.

Experiment 2

The old nest box was closed so that only the two new ones were available. Data were recorded at dusk, as the number of animals choosing each nest box to sleep in. This choice was defined as an animal entering a box and not reappearing within at least 15min.

Experiment 3

The nest box which had been preferred in Experiment 2 was reduced by 22 per cent of its internal volume, and data collected as in Experiment 2.

Experiment 4
The internal volume of the nest box was reduced by a further 22 per cent, and data collected as before.

Experiment 5
The reduced nest box was restored to full size and (in Group 1 only) the positions of the nest boxes reversed. Preference data were collected as before. This experiment was to check that any preferences shown by the animals were due to a box's position rather than to any features of the box itself.

Experiment 6
The least preferred nest box was raised to a height of 2.5m, and both boxes kept at maximum volume. Preference data were then collected as before.

Experiment 7
The elevated nest box was lowered to its former position, and the other one raised to a height of 2.5m. Preference data were again collected.

Results

Experiment 1

The marmosets started to investigate the new nest boxes straight away. Animals in Group 1 made no contacts with or entries into the old metal nest box once the wooden ones were available. They showed a significant preference for the left hand box – both in terms of their contact with it ($t = 6.76$, $df = 4$, $P < 0.01$), and of being inside it ($t = 4.76$, $df = 4$, $P < 0.01$), see Table 1. Animals in Group 2, however, did not show a significant preference, as measured either by contacts ($t = 0.72$, $df = 4$, ns) or being inside ($t = 2.32$, $df = 4$, ns).

Table 1 Results of the exploratory stage (Experiment 1). ns - not significant.

		No contacts/experiment		No in box/experiment	
Group 1	Right box	1.5	$P < 0.01$	0.3	$P < 0.01$
	Left box	6.8		5.2	
Group 2	Right box	3.5	ns	2.6	ns
	Left box	4.2		1.2	

Experiments 2–5

All Group 1 members chose to sleep in the left hand nest box every night, even after the first volume reduction. After the second volume reduction (Experiment 4) the box was evidently too small for all of them, and some animals slept on top of the left hand nest box instead – but none slept in the right hand nest box (Table 2). When the boxes were restored to their full size and their positions interchanged, the animals in Group 1 still all preferred the left hand position. Group 2 was a larger group (6 animals), and they distributed themselves between the two nest boxes. Nevertheless, before the first volume reduction, they showed a significant preference for the left hand nest box ($P < 0.01$, see Table 2). After the first and second volume reductions they showed no significant side preference.

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Experiments 6–7

When the non-preferred (right hand) box was raised to the top of the cage, the marmosets in Group 1 showed a clear preference for it and no longer slept in the lower left hand box (Table 2). When the positions of the boxes were reversed (ie left hand box elevated), the marmosets distributed themselves between the two boxes, with a slight, but not significant, preference for the highest box. In the larger Group 2, the animals showed no preference between the boxes when the right hand box was raised to the top of the cage, but showed a significant preference for the elevated left hand box ($P < 0.05$) when the positions were reversed.

Table 2 **Marmosets' use of nest boxes under the different experimental conditions (Experiments 2–7). Comparisons for Group 1, Experiments 2–6, were all significant. The probabilities for all other comparisons are as indicated, or not significant. *$P < 0.05$; **$P < 0.01$.**

Experiment	Mean number of animals per night in box			
	Group 1		Group 2	
	Right	Left	Right	Left
2 *Old box closed*	0.0	4.0	1.2	4.8**
3 *First reduction*	0.0	4.0	2.4	3.6
4 *Second reduction*	0.0	1.4	2.8	3.2
5 *Full size, positional reverse*	0.0	4.0	-	-
6 *Right box high*	3.8	0.0	3.0	3.0
7 *Left box high*	1.6	2.4	1.8	4.2*

Discussion

Clearly the marmosets in this study had particular preferences for nest box position, although these preferences were not necessarily predictable from prior knowledge of the natural history of this species.

The smaller Group 1 showed a significant preference for the left hand nest box even in the exploratory phase, although this may have been because this was the position of the old metal nest box. They maintained this preference even when the volume of the preferred nest box had been reduced (second reduction) to a level (c 4064cm^3) which would not permit all four animals to occupy it (the volume of a marmoset was estimated to be about 1200cm^3). Instead, some of the animals slept on top of the box. No such preference existed for the larger marmoset group, except during the period when the old nest box was closed but they had not experienced any box size reductions. At this stage all six animals could conceivably have occupied one nest box, but they distributed themselves between the two, with a significant preference for the left.

Cage variables that have been shown to influence callitrichid behaviour include cage size and complexity, both of which result in greater activity when increased, in cotton-top tamarins, *Saguinus oedipus* (Box & Rohrhuber 1993) and in common marmosets (Kitchen & Martin 1995; Kerl & Rothe 1996). Positional effects have been noted and have generally found that increased activity is correlated with greater illumination (Scott 1991), such as proximity to a window (Box & Rohrhuber 1993). None of these factors appear to account for the preferences shown in this study. However, Kerl and Rothe (1996) also showed that their marmosets sometimes preferred their nest box in a particular cell of the cage, for no obvious reason, although they suggested a preference for a position from which the room entrance could be observed.

As predicted, there was some preference for a highest-placed nest box in both of the study groups, although the nature of the preference again seemed to be influenced by other positional

variables. Preference for a high nest box has also been reported in red-bellied tamarins, *Saguinus labiatus* (Caine *et al* 1992).

Animal welfare implications

We conclude by agreeing with Kerl and Rothe (1996) that marmosets' preferences for cage furnishings are strongly influenced by environmental variables inside and outside the cage, but would add that these preferences may not always be predictable and would thus appear to us to be idiosyncratic. It has been suggested by other investigators (eg Dolins & Chamove [1987]) that the study of preferences might be important for environmental enrichment. Testing for these preferences need not take very long, but should be considered an important part of captive management.

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References

Box H O and Rohrhuber B 1993 Differences in behaviour among adult male, female pairs of cotton-top tamarins (*Saguinus oedipus*) in different conditions of housing. *Animal Technology 44:* 19-30

Caine N G, Potter M P and Mayer E 1992 Sleeping site selection by captive tamarins (*Saguinus labiatus*). *Ethology 90:* 63-72

Dawkins M 1976 Towards an objective method of assessing welfare in domestic fowl. *Applied Animal Ethology 2:* 245-254

Dolins F and Chamove A S 1987 Substrate use and locomotory behaviour in captive cotton-top tamarins (*Saguinus oedipus). International Journal of Primatology 8:* 548 (Abstract)

Hughes B O and Black A J 1973 The preference of domestic hens for different types of battery cage floor. *British Poultry Science 14:* 615-619

Kerl J and Rothe H 1996 Influence of cage size and cage equipment on physiology and behaviour of common marmosets (*Callithrix jacchus*). *Laboratory Primate Newsletter 35:* 10-14

Kitchen A M and Martin A A 1996 The effects of cage size and complexity on the behaviour of captive common marmosets, *Callithrix jacchus jacchus. Laboratory Animals 30:* 317-326

Scott L 1991 Environmental enrichment for single housed common marmosets. In Box H O (ed) *Primate Responses to Environmental Change* pp 265-274. Chapman & Hall: London, UK

Sussman R W and Kinzey W G 1984 The ecological role of the Callitrichidae: a review. *American Journal of Physical Anthropology 64:* 419-449