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# Presence of a privacy divider increases proximity in pair-housed rhesus monkeys

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## Abstract

*Use of a privacy panel in the home cage of female pair-housed rhesus monkeys has been reported to increase time spent in close proximity and time spent in affiliative behaviours. In the current study we measured these behaviours in more diverse populations; including male-male and male-female pairs of monkeys actively participating in cognitive experiments. We observed twenty-five pairs of rhesus macaques (*Macaca mulatta*) both with and without the presence of a privacy divider. Monkeys spent significantly more time in the same half of the pair-cage when the divider was in place. A significant increase in affiliative behaviour was not observed. The effects of privacy dividers previously reported for female monkeys partially extend to male pairs and mixed sex pairs under conditions typical of an active research setting.*

**Keywords:** *animal welfare, macaque, pair-housing, primate, privacy, social*

## Introduction

The Guide for the Care and Use of Laboratory Animals calls for social housing wherever possible (NRC 1996). The benefits of social contact among laboratory-housed primates are well-documented and compelling. Compared with isolates, monkeys housed with conspecifics show lower levels of stereotypic, self-injurious, and abnormal behaviour (Lutz *et al* 2003; Schapiro *et al* 1996). Play, exploration, and species-typical behaviour are enhanced by social housing (Schapiro *et al* 1996) and see Röder and Timmermans 2002 for a review. These behavioural improvements are accompanied by physiological benefits, including enhanced immune response (see Schapiro 2002 for a review) and lower blood pressure (Coelho *et al* 1991). This evidence, combined with the general success of pair-housing when properly implemented (Reinhardt 1994), highlights the importance and feasibility of promoting social contact in laboratory-housed primates.

The introduction of a privacy panel into home cages of pair-housed monkeys was previously reported to positively affect social behaviour (Reinhardt & Reinhardt 1991). A privacy panel affords monkeys the choice of visual isolation and the ability to exercise a degree of control over social contact. This may reduce stress, especially during feeding, thereby enhancing the stability of the pair's relationship. In a study of fifteen pairs of female rhesus monkeys (*Macaca mulatta*) the presence of a privacy divider saw a significant increase in time spent in the same half of the cage and time spent in affiliative behaviours. A non-significant trend towards a decrease in the number of agonistic actions was also reported (Reinhardt & Reinhardt 1991).

In the current study we tested whether these findings might apply to a larger and more heterogeneous sample of laboratory macaque monkeys. Reinhardt's study was limited, purely, to female pairs, under relatively undisturbed conditions, and in an altered housing environment (ie toys and perches normally present were removed during the study). In contrast, our subject pool contained male/male, female/female, and male/female pairs of monkeys and they were observed in conditions more consistent with active primate behaviour and cognition laboratories. Indeed, most of the monkeys in the current study were actively participating in behavioural testing protocols during the day. Testing required daily pair separation, removal from the home-cage, and control of food or water. Based on earlier findings (Reinhardt & Reinhardt 1991) we hypothesised that the presence of a privacy divider would: 1) increase the amount of time both monkeys spent in the same half of the cage, 2) increase the time spent in affiliative behaviours, 3) decrease the time spent fighting and, 4) decrease the instances of aggressive/fearful behaviours.

## Materials and methods

Subjects were fifty adult rhesus macaque monkeys aged between 5 and 13 years, housed in socially compatible pairs consisting of 18 male/male pairs, 2 female/female pairs, and 5 male/female pairs. Monkeys were housed in standard 1.3 $m^2$ or 1.8 $m^2$ cages (Allentown Caging Equipment, Allentown, NJ) depending on their weight and according to

**Figure 1**

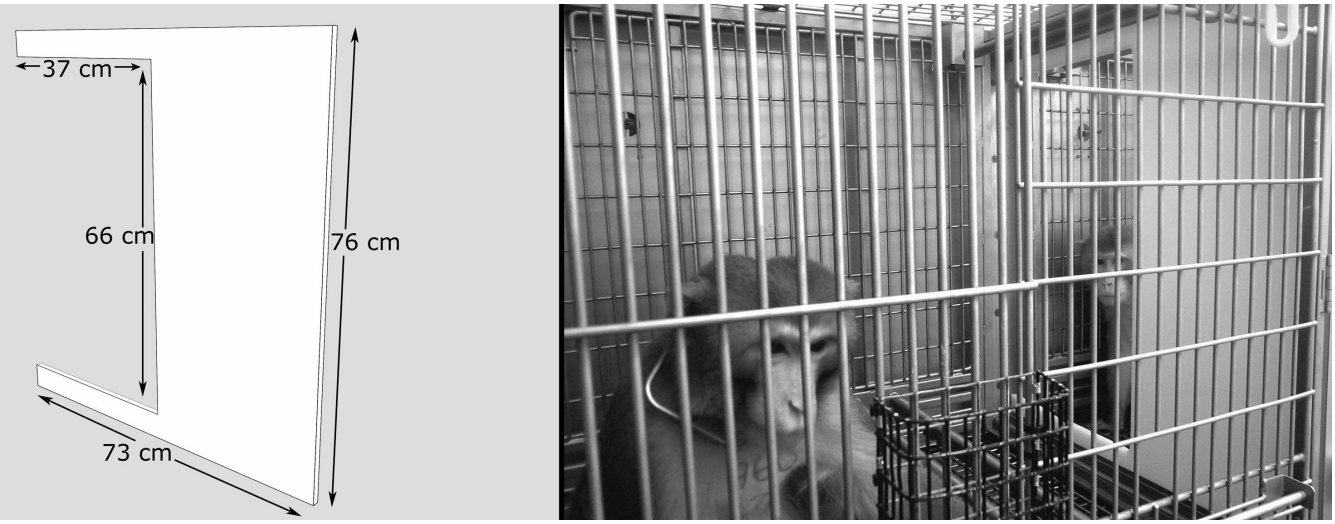



Diagram of the privacy divider (left panel) and photograph of the divider in place (right panel). The divider provides the possibility of visual isolation at the front of the cage while permitting monkeys to see, and pass, through the rear of the cage.

National Institutes of Health animal housing guidelines (NRC 1996). All cages contained hard rubber chew-toys and subjects could both see and hear individuals in other cages. Lights were on a 12:12 light-dark cycle, onset at 0700h. For the majority of subjects that were participating in cognitive tests for food or water reward, access to food or water was controlled in accord with NIH guidelines (NIH 2005).

The privacy divider was oriented in such a way as to physically and visually divide the front half of the cage, while leaving open access through the rear half (Figure 1). Stainless steel or white plastic panels were constructed with rear openings of either 33 or 37 cm width, depending on cage size (see Figure 1).

We used a within-subjects design in which each pair of monkeys was observed both with and without the privacy divider in place. The order that each pair experienced either condition was counterbalanced across monkey pairs. Behavioural assessments in each condition were preceded by one week of acclimation to the presence or absence of the privacy divider.

Following acclimation, observations were made in two × 30 min sessions conducted on consecutive days. The experimenter sat in the room, fully visible to the monkeys, and made observations in real time between 1700h and 1800h when monkeys were present in their cages and our observations would not interfere with ongoing research. The conditions were then switched and the animals were given another week to adapt. Two more observation sessions were then conducted for a total of four × 30 min sessions per pair (two in each condition). The following measures were taken: 1) Time spent in the same half of the cage; both monkeys had the majority of their bodies in the same half of the cage. 2) Time spent engaged in affiliative behaviours; monkeys were in non-aggressive physical contact. 3) Time spent fighting; prolonged aggressive contact that could not be broken down into distinct actions. 4) Number of aggressive/fearful behaviours; a discrete aggressive or fearful action or gesture directed towards the cagemate (barking/grunting, hitting/pushing, fear grimacing, biting).

## Results

Data from the two observation sessions within each condition were combined to give each pair a 'with divider' and 'without divider' score. These scores were then compared using two-sample *t*-tests for matched pairs (Aron & Aron 1999). Monkeys spent an average of 941 seconds in the same half of the cage when the divider was present compared to 795 seconds in the absence of the divider (Figure 2). This difference was significant ($T_{(24)} = 2.11$, $P < 0.05$). Average differences in affiliative behaviour (with divider = 439 seconds, without divider = 377 seconds) and aggressive behaviour (with divider = 0.16 instances, without divider = 0.14 instances) over the 30 minute period were not significant (affiliative: $T_{(24)} = 1.22$, ns; aggressive: $T_{(24)} = 0.15$, ns). Fighting was not observed in either condition.

## Discussion and animal welfare implications

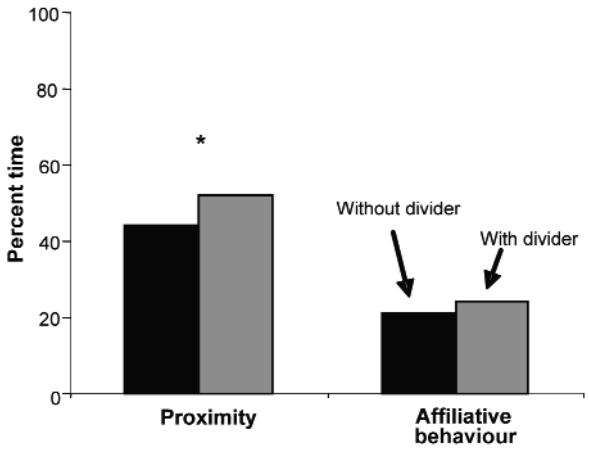
The results from this study partially confirm those of Reinhardt and Reinhardt (1991). The presence of a privacy divider increased the amount of time pairs spent in the same half of the cage in our more heterogeneous sample. While time spent in affiliative behaviours was not significantly affected by the presence of the divider, the average change was positive as reported by Reinhardt and Reinhardt (1991). The overall low rates of aggressive and fearful behaviour may have made it difficult to detect an effect of the divider on these measures. In any case, the low levels of aggression and fear attest to the general success of pair-housing primates.

We interpret our dependent measure, time spent in the same half of the cage, as a social behaviour. Proximity is often used in studies of animal behaviour to measure social tolerance or cohesiveness (eg Stoinski *et al* 2004; Curtis *et al* 2003, Van Loo *et al* 2004) and in humans it is used to indicate attraction or affection (eg Guerrero 1997; Burgoon 1991; Readdick & Mullis 1997). Thus, we conclude that the increase in proximity associated with the presence of the privacy dividers reflects an increase in social tolerance and/or attraction.

We suggest that a privacy divider may provide a safe haven and give monkeys the ability to diffuse hostile situations before they escalate. Without a privacy divider, pair-housing provides no refuge for a socially stressed animal. The opportunity to hide when afraid, or chase a cagemate out of sight when angry, may reduce tension and promote pair stability.

The behavioural and biological benefits of social contact and pair-housing have been documented (Lutz *et al* 2003; Schapiro *et al* 1996; Röder & Timmermans 2002; Schapiro 2002; Coelho *et al* 1991). Presenting monkeys with the choice of visual seclusion increases their proximity and may optimise the accompanying benefits. Thus, privacy dividers provide another tool to enhance the health and welfare of laboratory primates, reduce colony management problems, and protect the quality of research subjects.

**Figure 2**




Average percent of time spent in proximity and engaged in affiliative behaviours in the presence or absence of the privacy divider. * $P < 0.05$.

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