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# Does the presence of a human affect the preference of enrichment items in young, isolated pigs?

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ABSTRACT

Pigs may be housed individually in both production and research settings. Gregarious by nature, pigs kept in isolation may show behavioural and physiological signs of stress. In this study we investigated the preference of individually housed pigs, for social and non-social enrichments. Three enrichment items were compared: a mat (MAT), a companion (COM) and a mirror (MIR). Fourteen weaner pigs (Yorkshire × Landrace) were housed individually with continuous access to 4 adjacent pens. One pen was a control (CTRL) and had no enrichment; the others had one enrichment each, either a mat on part of the woven wire floor (MAT), a companion visible across the passageway (COM) or a mirror on one wall (MIR). Pigs spent more proportion of time ($P = 0.021$) in the COM pen ($0.65 \pm 0.07$) compared to the CTRL pen ($0.31 \pm 0.07$) with the MAT pen ($0.57 \pm 0.07$) and the MIR ($0.42 \pm 0.07$) pen as intermediates. They also spent more total time engaged in investigative and inactive behaviours in the COM pen compared to the CTRL pen ($P = 0.007$). A second analysis was performed to investigate changes in preferences in the presence or absence of a human in the room. The pens were then combined into two categories: social pens (COM and MIR) and nonsocial pens (MAT and CTRL). The probability of a pig being observed in the MIR pen when a human was present was significantly higher ($P = 0.0001$), than when absent. Within the social enrichments, the probability of the animal being observed in either MIR or COM pen was not different ($P = 0.017$). Our results confirm that preference studies may be highly sensitive to experimental conditions. Thus, the assumption that the most important preference is the one the animal spends most of its time with can be misleading. It appears that a mirror may be used by the animal for social support during periods of perceived threat, however further investigation is warranted.

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## 1. Introduction

The vast majority of animals used in laboratory settings continue to be rodents. In the UK, which has the most comprehensive animal reporting statistics, just over 80% of all animals used in experimental procedures are rodents, with 90% of this total being mice (Home Office, 2011). The use of rodents as models for humans and their applicability continues to be debated (Olson et al., 2000) and, as an alternative, pigs are gaining popularity for use as models in many areas of biomedical research (Schook et al., 2005). This increase in use is mainly driven by the fact that pigs have many similar physiological and anatomical features to humans such as their skin, digestive and cardiovascular systems (Bollen et al., 2010). However there is also societal

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pressure to reduce the number of primates and companion animals, such as dogs, used in research, although the ethical "acceptability" of pigs as experimental animals continues to be debated (Webster et al., 2010).

Within research and laboratory settings, pigs are often housed in isolation and in barren environments. These housing conditions are generally designed for optimal control over the environment and a perceived, though disputed (Richter et al., 2009), need for environmental standardization necessary to safeguard reproducibility (Beynen et al., 2003). Although pigs are endorsed as readily adaptable to a variety of systems (Kyriazakis and Whittemore, 2006) these statements pertain to the health and productivity of pigs in a commercial farming setting, and do not take pig behaviour and welfare into account.

Social isolation of gregarious animals is capable of inducing high levels of stress (Boissy and Le Neindre, 1997; Piller et al., 1999; Spani et al., 2003). Placing a socially evolved animal into isolation eliminates their ability to benefit from communal living advantages, which in nature would include defence against predators, improved foraging, information exchange, pathogen resistance to or after exposure, and pooling of resources (Burger and Gochfeld, 2001; Mendl and Held, 2001; Ward and Zahavi, 1973). Despite the fact that their need for these social strategies is practically eliminated in captivity, social animals still become stressed by isolation (Andersen et al., 2006). For example, young pigs especially show behavioural and physiological signs of stress when housed in isolation such as increased cortisol production (Ruis et al., 2001; Stolba and Wood-Gush, 1989), decreased body temperature (Ruis et al., 2001), decreased Tumour Necrosis Factor-alpha (TNF-$\alpha$) (Tuchscherer et al., 2004), and increased frequency of behaviours associated with anxiety and stress (Herskin and Jensen, 2000; Tuchscherer et al., 2006). Similarly, housing within barren environments may also modify pigs' behaviour and physiology. For example, in commercial settings, barren environments have been shown to elicit increased aggression (O'Connell and Beattie, 1999), decreased behavioural diversity (Haskell and Hutson, 1996), increased adrenal weights (Beattie et al., 2000) and lower growth rates (Lyons et al., 1995).

A common buffer for the stress caused by isolation and barren housing is the implementation of environmental enrichment. Environmental enrichment involves the enhancement of an animal's physical or social environment and may be defined as "an improvement in the biological functioning of captive animals resulting from modifications to their environment" (Newberry, 1995). Environmental enrichment is increasingly viewed as an essential research component (Guide for the Care and Use of Agriculture Animals in Research and Teaching, 2010), but the forms that the enrichment may take will be constrained by the setting in which the animal is being kept – i.e. within a zoo, a laboratory or on a farm. For pigs, the majority of enrichment studies have been carried out on farm settings, where characteristics such as ingestible and destructible become important over time (Van de Weerd et al., 2003) and the provision of straw is seen as having high potential in effectiveness (Van de Weerd and Day, 2009). For laboratory pigs it is critical that the enrichments should positively enhance the pig's biological functioning, yet be practical to employ within a laboratory setting. Laboratory housing for swine presents difficult challenges due to the need of a sterile and clean environment. Additionally, nutritional studies often closely monitor feed intake and providing ingestible material may compromise the results (Dean, 1999). For these reasons, it will be beneficial to develop enrichments targeted to areas of the laboratory environment that may be possibly stressful to the pigs. Consequently, ingestible and destructible enrichment items could not be considered for this study. Unfortunately, little quality research has been done on the enrichment benefits and preferences in laboratory housed swine (Bollen et al., 2010).

For these reasons, our experimental enrichments focused on two items that we expected to be important for a pig housed individually in a laboratory type environment; namely companionship and comfort. Firstly, knowing that pigs are highly social and that isolation is stressful, we offered the pigs access to sight and relative proximity to another pig. We also investigated whether provision of a mirror could simulate the presence of a conspecific. Secondly, knowing that pigs in indoor housing systems spend the vast majority (over 75%) of their time inactive (Broom et al., 1995), we offered the pigs access to a rubber mat that may offer a more comfortable lying surface than perforated metal (Tuyttens et al., 2008) and confer skin lesion score benefits (Elmore et al., 2010). In order to test the relative importance of these enrichments, we used a preference test in which the pigs could choose to spend time with only one resource.

Preference tests have been used historically as a method of analysing an animal's preferred option, including enrichment objects. However, preference tests are often criticized for their results being highly specific to the particular conditions in which the test is carried out (Dawkins, 1982; Duncan, 1978; Hughes, 1976; Kirkden and Pajor, 2006). The presence of a human in the room can affect behaviour and physiology of rats (Cloutier and Newberry, 2010) and it has been shown that a pig's fear of humans can influence its welfare and productivity (Rushen et al., 1999). Human presence could also influence the pig's preference. Our objectives therefore were to determine the preference of individually housed pigs for different enrichment items comprising a mat, a conspecific companion, or a mirror and whether these preferences are influenced by human presence.

## 2. Materials and methods

All procedures in this experiment were approved by Purdue Animal Care and Use Committee prior to conducting the experiment (PACUC approval 09-055). The experiment took place during the months of March, April, and May of 2010. The animals used in this study were returned to Purdue University swine herd at the end of the experiment.

### 2.1. Animals, housing and management

Sixteen, male Yorkshire $\times$ Landrace weaner pigs (mean $\pm$ SE, 22.7 $\pm$ 2 kg in weight) were used as test