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Searching for differences in the behavioural response of piglet groups subjected to novel situations

Diego Magnani*, Simona Cafazzo, Pietro Calà, Leonardo Nanni Costa

Dipartimento di Protezione e Valorizzazione Agroalimentare (DIPROVAL), University of Bologna, Reggio Emilia, Italy

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ABSTRACT

The Backtest (BT), the Open Field (OF) and the Novel Object (NO) tests have been used to identify individual reaction patterns in piglets and to measure parameters that previous studies have shown to be correlated to the coping strategies of animals. The BT allows for the classification of piglets into two different "coping styles": high-resisting (HR) and low-resisting (LR), which respectively correspond to a (pro-)active and passive (or reactive) behavioural response.

During previous research, the subjects were tested singularly, so the aim of this study was to investigate if differences between HR and LR animals could be detected when piglets are tested in a group using the OP and NO tests.

A total of 132 piglets were subjected to the BT and then were housed in groups consisting of four individuals each so as to obtain HR pens, LR pens and mixed pens. We found differences in the pigs' behaviour during the OF and the NO tests and according to the type of group. Individual differences in the behavioural response of piglets to the Backtest were not predictive of the behavioural response of the animals subjected to the OF or to NO tests.

Our results show that there are no relevant differences between HR and LR piglets when they are subjected in a group to novel situations.

1. Introduction

Over the past two decades, coping strategies have gained increasing attention in animal ethology. Livestock animals encounter many stressors during their life and coping with these stressors affects their health, welfare and production (Van Erp-Van der Kooij et al., 2002).

Previous research on coping characteristics, predominantly in rodents, have generally supported the existence of two distinct "coping styles" within populations, an active (or proactive) and a passive (or reactive) style (see Koolhaas et al., 2007 for a review). One of the most important difference between active and passive individuals lies in the way they use internal and external information to organize behaviour associated with a given stimulus (Koolhaas et al., 1997). Actively coping individuals create routines and seem to anticipate situations, whereas passive individuals tend to react more to environmental changes (Benus et al., 1991; Koolhaas et al., 1997).

Aggressiveness in the resident-intruder test is central to much of the work on coping styles in mice and rats (Benus et al., 1991; Koolhaas et al., 2007), whereas in pigs, the Backtest is a more popular measure of coping and its outcomes have been compared with the responses of the same pigs in a variety of social tests (Hessing et al., 1993, 1994; Ruis et al., 2000; Van Erp-Van der Kooij et al., 2000, 2001; Geverink et al., 2003).

The behavioural reaction of piglets in this test is thought to reveal part of their "coping style", enabling two different behavioural strategies to be identified. During the test, a piglet is put on its back and restrained in this position for 1 min, while the number of escape attempts is recorded. Some piglets, usually referred to as 'high resisters' (HR), struggle a great deal during the Backtest, whereas piglets at the other end of the distribution, the so-called 'low resisters' (LR), tend to respond with immobility. The response profiles of HR and LR piglets largely resemble the diverging coping styles, often referred to as (pro-)active versus passive/reactive.

Some attempts to categorize piglets into distinct personality types, as done for rodents, have not been successful and have shown divergent results (Lawrence et al., 1991; Jensen et al., 1995; Forkman et al., 1995; Spoolder et al., 1996). Moreover, the Backtest has also been criticised as being arbitrary in nature because it is not clear what motivational system it challenges (D'Eath, 2002). In fact, the piglet may perceive the handler as a predator, evoking escape, or behave as though in a fight with a conspecific, perhaps evoking an aggressive response (Jensen et al., 1995).

* Corresponding author.
E-mail address: diego.magnani@studio.unibo.it (D. Magnani).

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Moreover, Backtest responses do not fall into two distinct 'types' of responders as has been claimed for coping responses in other species (Koolhaas et al., 1997) because there is no clear evidence for a bimodal distribution characteristic of discrete styles (Forkman et al., 1995; Erhard and Mendl, 1999; Van Erp-Van der Kooij et al., 2000).

If differences in behaviour reflect coping characteristics, then behaviour in one situation should predict behavioural reactions in other situations and at other times. It is often assumed that individuals are relatively consistent in their response to an environmental challenge at different times (ages) and in different situations (Lawrence et al., 1991; Van Erp-Van der Kooij et al., 2000). These relatively stable individual characteristics that show some consistency over time and across situations are also referred to as temperament. Temperament refers to the particular configuration of behaviours that an individual expresses and is therefore a property of an individual (Bell, 2007).

In a study on individual behavioural characteristics in pigs (Hessing et al., 1994), it is stated that the complementary individual behavioural characteristics of active and reactive pigs under stress will result in a better socially integrated group. A socially well-integrated group will be more successful in solving their problems, which is beneficial for each individual and for the group as a whole. This is shown in two studies where active (HR) and reactive (LR) pigs were mixed. It was found that the most stable social relationship existed between HR/LR pairs where the LR animal was dominant (Ruis et al., 2002) and that HR/LR groups performed better in term of growth rate and weight (Hessing et al., 1994).

In previous research, pigs have often been tested at a later age (Lawrence et al., 1991; Brown et al., 2009) or singularly (Jensen et al., 1995; Spoolder et al., 1996; Wemelsfelder et al., 2000; Dalmau et al., 2009). With an eye to advancing knowledge about this subject, we studied piglets reared in small groups and tested them with their home pen mates to avoid behavioural responses due to isolation. Therefore, the aim of the present study was to investigate whether there are any consistent in individual variations in piglet behaviour in reaction to different challenges and whether group composition has any significant effect. For the purpose of identifying individual reaction patterns in pigs, the Backtest, the Open Field test and the Novel Object test were used. To evaluate the influence of group composition on the outcome of behavioural tests, different groups were created based on the Backtest scores and members of each group were tested all together. If group composition affects the ability of animals to solve their problems (e.g. cope with stressful situations), we would expect to find differences in behavioural response between groups consisting of both HR and LR individuals and groups with LR or HR pigs only.

2. Materials and methods

A total of 132 piglets from 37 litters of commercial crossbred pigs (Duroc × (Landrace × Large White)) were tested from April to September 2009 in four replicates of 33 subjects each.

Male piglets were castrated at approximately 5 days of age. All sows and their piglets were housed in conventional farrowing pens (1.5 m × 2.5 m), where each sow was restricted in a farrowing crate. At weaning (day 25 ± 2) piglets were removed from the farrowing pens and mixed in two pens of about 3 m × 3 m. At 33 (±2) days of age all piglets were transported to the experimental farm of DIPROVAL, where they were housed in pens (1 m × 1 m with 4 animals) with slatted floors.

Each pig was fed two times a day from a five-space feeder containing a normal commercial feed and water was supplied ad libitum using a water-nipple.

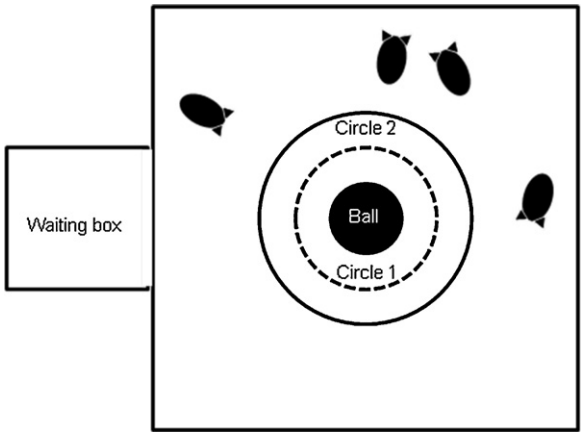

Fig. 1. The guillotine door on the Waiting box could be opened and closed through the use of an attached rope. Another attached rope was used to drop the ball, so the observers could not be seen by the animals.

2.1. Backtest

All piglets were tested twice during the suckling period, once at 10 days and again at 17 days. In this test each piglet was restrained on its back by placing the right hand over the throat and the other loosely on the hind legs (Hessing et al., 1993). Classification of pigs was based on the number of escape attempts (i.e. bouts of struggling with at least the hind legs) they displayed during 60 s. The classification of each individual was based on the outcome of these two Backtests. A pig was classified as high-resisting if it performed more than four escape attempts during the two tests, with a minimum of two attempts per test. If a pig struggled less than four times in two tests, with a maximum of two attempts per test, it was labelled low-resisting (Hessing et al., 1993). All remaining piglets were classified as "indefinite" and were excluded from the study, which included exclusively LR and HR subjects.

From the 196 piglets tested during the suckling period, we selected 66 HR and 66 LR individuals with similar body weights (6.36 ± 2.05SD kg at 17 days of age), for a total of 132 (seventy-two male and sixty female) piglets. They were housed in groups of four, for a total of 12 HR pens, 12 LR pens and 9 mixed pens (2 HR and 2 LR piglets).

2.2. Open Field test and Novel Object test

The Open Field (OF) and Novel Object (NO) tests were carried out when the piglets were between 42 and 46 days of age. Piglets housed in the same pen were tested together in a 3 m × 3 m isolated arena, so that they could not establish visual contact with other piglets in the same building. The arena had 2 circles painted on the centre of the floor, the first measuring 1 m in diameter (circle 1) and the second, which included the first one, measuring 1.5 m in diameter (circle 2). The four subjects were initially put into a waiting box (1 m × 1 m) close to the arena. Piglets stayed in the waiting box for 2 min. The OF test started when the box door was open and piglets could have access to the arena (Fig. 1). After 10 min an object that was unfamiliar to the piglets (a 50 cm diameter blue ball) was dropped down into the arena and the NO test was started. The object fell exactly in the centre of the small circle painted on the floor, suspended 20 cm above the floor, without touching the floor or walls or making a noise; when the ball fell, all piglets had a movement reaction. The NO test lasted 15 min so that the total duration of the two consecutive tests was 25 min.

All tests were video recorded with two Handy cams (DCR-HC42E, Sony). During video analysis, all behavioural patterns (for a description see Table 1) were recorded using the classical