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Qualitative Behavioural Assessment of emotionality in pigs

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ABSTRACT

Scientific assessment of affective states in animals is challenging but vital for animal welfare studies. One possible approach is Qualitative Behavioural Assessment (QBA), a 'whole animal' methodology which integrates information from multiple behavioural signals and styles of behavioural expression (body language) directly in terms of an animal's emotional expression. If QBA provides a valid measure of animals' emotional state it should distinguish between groups where emotional states have been manipulated. To test this hypothesis, QBA was applied to video-recordings of pigs, following treatment with either saline or the neuroleptic drug Azaperone, in either an open field or elevated plus-maze test. QBA analysis of these recordings was provided by 12 observers, blind to treatment, using a Free Choice Profiling (FCP) methodology. Generalised Procrustes Analysis was used to calculate a consensus profile, consisting of the main dimensions of expression. Dimension one was positively associated with terms such as 'Confident' and 'Curious' and negatively with 'Unsure' and 'Nervous'. Dimension two ranged from 'Agitated'/'Angry' to 'Calm'/'Relaxed'. In both tests, Azaperone pre-treatment was associated with a more positive emotionality (higher scores on dimension one reflecting a more confident/curious behavioural demeanour) than control pigs. No effect of drug treatment on dimension two was found. Relationships between qualitative descriptions of behaviour and quantitative behavioural measures, taken from the same recordings, were found. Overall, this work supports the use of QBA for the assessment of emotionality in animals.

1. Introduction

The assessment of affective states in animals is a critical component of animal welfare research. In recent years a variety of approaches have been applied to address this (e.g. appraisal theory: Boissy et al., 2007a; cognitive bias: Mendl et al., 2009). Qualitative Behavioural Assessment (QBA) is one such method. QBA is a whole-animal approach, and the underlying premise is that human observers can integrate perceived behavioural details and signals to judge an animal's behavioural expression, using qualitative descriptors (e.g. relaxed, anxious) that reflect the animals' affective (emotional) state (Wemelsfelder, 1997, 2007). QBA allows for a scientific basis to be applied to the characterisation of behavioural expressions of animals in terms of their affective experience. A number of studies in pigs (Wemelsfelder et al., 2001, 2001, 2009) and other species (Rousing and Wemelsfelder, 2006; Napolitano et al., 2008; Minero et al., 2009; Walker et al., 2010) have shown that data generated from such observations are reliable and repeatable, and correlate to assessments of the animal's physical behaviour. As such, there is increasing indication that QBA can be a valuable methodology for assessing behavioural expression in farm animals under field conditions (Brscic et al., 2009; Wemelsfelder and Millard, 2009), and more broadly, that qualitative rating scales can have useful practical applications in assessing animal behaviour

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(Meagher, 2009). A recent review of methodologies that might be used to assess positive welfare states in cattle concluded that QBA was 'the most promising' assessment methodology (Napolitano et al., 2009). Boissy et al., 2007b also noted that QBA represented one of the most immediately applicable methodologies for assessing positive emotions in animals. A report from the UK Farm Animal Welfare Council (FAWC, 2009) on the future of animal welfare research emphasised the importance of including consideration of positive welfare states and the role that QBA could play in assessing these.

For QBA, like any new measurement tool, the on-going process of validation is critical. Validation is a process of iterative hypothesis testing; as more is learnt about the construct putatively underlying the measurement scheme, new predictions can be generated and tested against further observation (Streiner and Norman, 2008). In this broad view, the validity of a measurement tool is never completely proven; successive new data influence the degree of confidence that can be placed on inferences about individuals based on their scale scores. Consequently, no one experiment can be carried out which ultimately proves the theory underlying the relationship between the tool and the construct it is thought to measure (Streiner and Norman, 2008). To date QBA has stood up well to the process of validation testing from the perspective of its reliability and relationship to quantitative measures of behaviour. An important ongoing question is whether and how QBA outcomes relate to physiological and neurobiological parameters, an issue considered crucial by many scientists in demonstrating the biological validity of QBA. A promising start in addressing this question was made by Stockman et al. (2011), who found QBA outcomes to correlate well to a number of physiological stress indicators in cattle during transport.

In this study, QBA was applied to video recordings taken from young pigs exposed to either an open field (OF) or Elevated-Plus-Maze (EPM) test with or without pretreatment with Azaperone. Azaperone is a butyrophenone neuroleptic drug currently licensed for pigs (to prevent aggression and stress, e.g. Tan and Shackleton, 1990). Although primarily used as a sedative, at low doses Azaperone has been found to reduce emotionality in sheep tested in an open field test (Hughes et al., 1977) and to increase inter-individual distance and lower shade preference when given to sheep before testing in a novel environment (Madsen et al., 1980). More broadly Azaperone is thought to act on the brain to make animals indifferent to their surrounding environment (Dantzer, 1977; Pascoe, 1986). Studies have shown that Azaperone causes quantitative changes in pig behaviour that could be interpreted as indicating an anxiolytic effect (Donald et al., 2010, 2011). Behavioural tests such as the EPM and OF are commonly used to examine states of anxiety and fear in many species, including pigs, yet their validity is often only poorly established in farm animals (Forkman et al., 2007). The work presented here was part of a series of experiments which aimed to examine the validity of using OF and EPM behavioural measures to assess emotionality in pigs. The specific aim of the current study was to test how QBA judgements of behavioural expression differed when observers viewed footage of pigs whose emotional state had been putatively altered through prior treatment with Azaperone compared to control pigs treated with saline.

2. Methods

2.1. Animals

This study was conducted following ethical approval by the Animal Experiments Committee at SAC, and under UK Home office licence. Two separate experiments were carried out examining the effects of the drug Azaperone on pig behaviour in either an open field (OF) or elevated plus-maze (EPM) test. Quantitative behavioural measures from the OF observations assessed here have been previously published (Donald et al., 2011). In both experiments, piglets were born in standard farrowing crates and weaned into pre-allocated smaller groups of 4–6 (balanced as far as possible for sex and weight) at around 4 weeks of age. They were then moved to pens (2.85 m × 1.85 m) with concrete floors and deep straw bedding. All animals had *ad libitum* access to feed and water and pens were cleaned daily and replenished with fresh straw.

2.2. Experiment 1: open field

In Experiment 1, the subjects were 12 (7 males, 5 females), 38.0d (SD = 1.0 d) old Landrace × Large White pigs taken from 3 litters. Each pig was tested in the OF twice (exposure one and exposure two) for 10 min in a cross-over design, once with a (1 mg/kg) pre-exposure intra-muscular injection of Azaperone (Stresnil: Janssen Animal Health (Elanco), Brussels, Belgium) and once with a pre-exposure intra-muscular injection of an equivalent volume of saline. The first and second exposures were 3 d apart and the order in which pigs were tested was maintained on both occasions. Following injection in the home pen, pigs were left undisturbed with littermates for 20 min before being observed in the test apparatus in an adjacent room. To start the test, each pig was picked up and carried to an adjacent room where it was placed in the open field. The open field arena (1.84 m × 1.89 m) had 0.90 m high solid walls, a concrete floor, and was provisioned with two unfamiliar objects, an orange ball (65 cm circumference) and a feeder (21.5 cm × 9.5 cm × 9.0 cm). The arena was washed down with water between pigs to reduce odour from the preceding pig. During the test, pig behaviour was recorded onto a digital video camera for subsequent analysis. Two 1 min periods during the test (min 1 and 8) were selected from each recording for subsequent qualitative analysis. Min 1 was chosen to show the initial reaction to the test and min 8 was chosen as an arbitrary point towards the end of the test.

2.3. Experiment 2: elevated plus-maze

Subjects were 28 (16 males, 12 females), 57.5 d (SD = 0.5 d) old Landrace × Large White pigs taken from 3 litters. Each pig was tested once in the EPM for a period of 5 min. Half the pigs ($n = 14$) received a pre-exposure intramuscular injection of Azaperone (1 mg/kg) and half ($n = 14$)